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Institute Discusses Post-War Problems

Despite Many Troubles Due to Labor Conditions,
Iron and Steel Manufacturers Are Optimistic—
Judge Gary Mentioned as a Presidential Possibility

THE meetings of the American Iron and Steel Institute during the period of the war, when the members were bending every energy to do their full part in bringing a speedy victory, were characterized by the enthusiasm and intensity of feeling which also marked the meeting last October on account of the steel strike. At the October meeting, the enthusiastic endorsement given to Judge Gary on account of his action in resisting the demands of organized labor, was a prominent feature. At the seventeenth general meeting held last Friday at the Hotel Commodore, New York, there was not the intensity of feeling previously manifested, and this was natural, but there was a genuine realization of the seriousness of present conditions, especially those relating to labor, and the attendance exceeded 1300, there being 1321 at the banquet compared with 1330 last October.

The conversation in the lobby indicated that nearly everyone is having a full share of troubles due to the railroad situation, but the prevailing sentiment was optimistic. That even the troubles were not taken with too much seriousness was shown by the humorous address by W. U. Follansbee, secretary and treasurer of Follansbee Bros. Co., Pittsburgh.

The technical papers were of the usual high order. Mr. Close's paper on Welfare Work of the Steel Corporation was accorded the unusual honor of a special vote of thanks on motion of W. A. Rogers, Rogers, Brown & Co., and seconded by Willis I. King, vice-president Jones & Laughlin Steel Co. Notable absentees were President James A. Farrell of the Steel Corporation who had not yet returned from his trip to California, where he attended the meeting of the Foreign Trade Council, and Hon. J. A. McCleary, secretary of the institute, who was absent on account of illness.

In his opening address, Judge Gary paid an earnest tribute to the loyalty of the members of the institute, to the iron and steel business and to the country and spoke of their influence in the affairs of the nation. Referring to the dark days of the panic of 1907, Judge Gary recalled the words of J. Pierpont Morgan, of whom he spoke as "our beloved associate," who said, "Stand steady boys, play the game and play it fair." The iron and steel men did stand steady and played the game and played it fair in that critical period and throughout the war and now in another period they were ready to

again do their full duty. Judge Gary emphasized the importance of the members doing their utmost to protect, not only their own interests, but those of their employees and above all those of the public.

At the banquet, Judge Gary presided and announced that the responses to toasts would be entirely by members of the institute. He said that the day had been one of inspiration and congratulated the institute upon the commanding influence that it has acquired in the affairs of the nation. He spoke in a very gracious manner of the ladies and said, "Who can tell but that we may see some of our splendid women placed in charge of our important industries and admitted to membership in the institute?"

Joseph G. Butler, Jr., referring to Judge Gary's description of the kind of man he thinks the country should have for president, said: "If Judge Gary would add about 50 per cent to that estimate, he would describe himself." This reference to a possible dark horse in the presidential race was agreed by enthusiastic applause and Mr. Butler added, "I am a delegate to the Chicago convention; that is all I have to say on that subject."

Willis I. King, vice-president of the Jones & Laughlin Steel Co., spoke of the early days of the industry when there were hard times nearly all the time with many failures. He referred to the low tariff which was enacted in 1913 and to the importations of steel from foreign countries in 1914. He said that this would have proved disastrous had war not been declared. He predicted that the low tariff will cause disaster and made an appeal for the revision of the present Underwood law. He advocated the closer relations of members of the institute, and suggested that it might be well to establish a steel magazine, but he especially urged united action in regard to a protective tariff.

Colonel Robert W. Hunt, president R. W. Hunt & Co., Chicago, spoke of his long experience, including 30 years as an employer, and expressed the opinion that the American workman, as a rule, is a good man, who goes wrong only when influenced by bad advice. He denounced the attitude of any organization which attempts to hamper men in doing their utmost with their God-given powers. He took an optimistic view of the future because he said that unsound principles could not last. Referring to the labor question, he spoke of having recommended several years ago that Chinese labor be im-

ported to this country under contract, and he renewed that suggestion, expressing the belief that the Chinese, if brought to this country for a period of five years, would not only help in solving the labor questions in industries, but would be of great assistance to the ladies in their home work. He also said that the Chinese would learn to use American implements and upon returning to China would greatly encourage the use of these implements in that country.

W. U. Follansbee, Follansbee Bros. & Co., spoke in a lighter vein of the industrial troubles of to-day, particularly of the flimsy excuses that are made by workmen to avoid work.

Dr. Henry M. Howe, professor emeritus of Metallurgy, Columbia University, made an earnest address upon conditions growing out of the war.

At the conclusion of Professor Howe's address, Judge Gary announced that he would ask the members to call for anyone they wished to hear. Of course there was an immediate demand for Charles M. Schwab, chairman of the Bethlehem Steel Corporation. Mr. Schwab, after telling a few new stories, referred to the decision of the Supreme Court in

favor of the United States Steel Corporation in the dissolution suit, and heartily approved it, so did the audience, judging from the applause which followed, and it became even more demonstrative when Mr. Schwab said that the great need of the country to-day is to have a man in the White House who will choose his subordinates regardless of politics and added, "No one is so well qualified to do that as is the distinguished president of the American Iron and Steel Institute." Mr. Schwab poked a little fun at Mr. King on account of his suggestion of starting a newspaper. "It may be better," said Mr. Schwab, "to establish closer relations by lending each other money. Anybody who would like to take up this matter with me can have a conference with me after dinner." This sally was greeted with much laughter. Mr. Schwab then went on, speaking in a serious vein. He commended the loyalty of the members and urged them to continue in this spirit, for it surely would bring happiness and success. He said that he had a reputation for being an optimist, and that in spite of the depressing conditions to-day, an American citizen, if he sees things in the right way, must be an optimist.

Judge Gary on the Ship of State

He Discusses the Rights and Duties of Employers, Employees and the Public—His Ideal of the Presidency

THE subject of Judge Gary's opening address was the "Ship of State." He spoke in part as follows:

"There are no classes in the United States such as have existed in other countries. Formerly, in certain parts of the world, classes were actually formed and sustained by the rich or powerful, who were supposed to belong to the 'upper class.' They became distinct and commanding. They secured and continued to hold additional privileges and benefits to which they were not justly entitled, and which made them proud and overbearing. They were doomed to eventual failure and final destruction, except so far as they might be deserving on the merits. In America those who now seek to establish classes and to secure discriminating favors for themselves are not prominent because of wealth; they are composed of a comparatively small minority of the population who have adopted the word 'labor,' which signifies honorable activity, with the concealed design of forming a 'class' which they hope will finally attract a majority of the people, and thus enable them to obtain one legislative act after another until the Constitution shall be undermined and the whole structure destroyed.

"In a discussion of this kind there should be a frank admission that no one is without fault; that every variety of human nature may justly be censured. And for purposes of illustration, we may refer to groups of persons and interests. We could not accurately speak of them as classes; but these groups might be, and heretofore have been, mentioned as the capitalistic group (including their representatives), the labor group, and the general public. Slight effort at analysis will demonstrate how far short of accuracy these descriptions are.

"Who compose the first group? Those who have accumulated property; if so, how much?

"Who make up the second? Those who work with their hands; if so, with the shovel, the lever of a machine or the pen?

"Who constitute the third? Those who neither possess pecuniary resources nor perform any labor? If so, there is none to be considered in this connection, for the group would be small in numbers and subjects of charity or public control. Obviously, the public is made up of the entire population.

"And yet, we can comprehend to some extent what is in the minds of some of the writers and speakers

who undertake to make these classifications to which I have alluded.

Employers

"I will, for present purposes, place the members of this large audience in the first group. Most of you are possessed of accumulated savings and occupy important positions, although you started from the lowest rung of the ladder of success, and because of merit and hard work have reached your present station in life. You have, in management, in greater or less degree, marked responsibilities in regard to each and all of the groups described. You could not shirk or minimize them if you desired to do so. As a business citizen you must account to others for your stewardship. What you say, what you do, will have an important influence in national, even international affairs. It will be good or bad. You must consistently observe the principles of the Constitution, the provisions of the laws of the land, the rights and interests of your neighbors, including your employees, customers, competitors and the general public. You must be unselfish, reasonable, fair, sincere and honest. You should, without interruption, give evidence of a disposition to conciliate and co-operate. Regardless of the past, even though you may believe you have been unjustly treated or censured, you should and will make and keep resolutions for the future which you know are proper. All this, of course, applies with full force to your president.

"If we adhere firmly to these principles, if we are steadfast and true; and then courageously, though modestly, proclaim our rights and insist upon proper consideration in return, it will be accorded. We have heretofore been somewhat backward in this respect.

Employees

"Employees generally are included in the second group. With all others they have full and equal rights and responsibilities. They must and will realize that their advancement and contentment depend upon the progress and prosperity of the employers; that, except for the willing and free investment of capital up to the requirements of business demands, together with full co-operative assistance on the part of the best talent, enterprise and initiative would languish and disappear and that indifference and idleness would be substituted.

"Agitators who are trying to create trouble between employees and their employers as a rule are insincere and selfish. Generally, they themselves have performed no hard labor, nor had experience which qualifies them to lead or instruct. They strive for personal popularity and gain. Their business is better, their compensation increased, when others are in trouble. Assuming to be sympathetic and superior in intelligence, they mislead and often misrepresent. They promise reforms, but their methods led to trouble and loss to others. In this list are included a few writers, lecturers, public speakers and self-appointed labor leaders, so called.

"The great masses of employees, if left to decide for themselves, are loyal to the country, to the public interest and to their employers; and to the extent of this loyalty they will be rewarded up to the full measure of their deserts. This they will have the right to demand; and it will be readily and cheerfully accorded. They also should, and they will, continuously exercise a disposition to conciliate and co-operate. As applied to all groups, faithful performance, and this only, will insure highest pecuniary results and most liberal treatment.

The Public

"In the classification suggested, the public comprehends every citizen except the individual who is discussing the subject. Speaking of men we can define interest only as either public or private. Depending upon the question under consideration, we may embrace in the word 'public' a community, a village, city, county, commonwealth or nation; but the question comes back to either public or private interest.

"As each individual in the groups heretofore mentioned is obligated to conduct himself or herself in such manner as to promote and not impair the public welfare, so the public is likewise responsible to the individual. In public discussions, and occasionally in newspaper editorials, it is frequently assumed that there is no corresponding and reciprocal duty on the part of the general public whom, at the particular time, the speaker or writer attempts to represent. Unjust attacks or criticisms against individual interests, sometimes promiscuous, in other instances by name, are made from a biased standpoint or upon distortion of the facts. The exact truth is not infrequently ignored or overlooked. Many able discourses in the press, in the Congress of the United States, by public officials, even from the pulpit, are based on a misstatement of the facts.

"The speakers or writers who are recklessly unjust are rare exceptions. But for this reason, if for no other, they perhaps receive considerably more extended notice.

"The volunteer guardians of the public welfare and of private individuals and interests are numerous and audacious. They wrap about themselves the cloak of self-righteousness and proclaim from the housetops. The public has a duty to perform in exposing and controverting hypocrisy and sham on the part of the reckless and irresponsible.

"Every individual should under all circumstances receive from all others honest and fair consideration. There should not be, there must not be, any discrimination against or in favor of any particular group of

persons if this country is to retain the position among the nations to which it is justly entitled.

"The general public, whether it is represented by governmental heads, by Congress or otherwise, should co-operate with and assist private enterprise. Every department of government has responsibilities and opportunities of magnitude at this particular period in our history, remembering that general prosperity is the first essential. They can do much toward the preservation or destruction of the Ship of State. They can by precept and example contribute in rehabilitating and re-establishing the affairs of this country. For constructive statesmanship, which will add to stability and progress in the moral, economic, social and political life of the nation, they will be entitled to the commendation of all mankind; while by a narrow-minded, partisan, fault-finding, destructive policy, they will create discord, distress and demoralization. The majority of the people of this country are tired of petty animosities, of unreasonable rewards or punishments, of undue restrictions or liberality concerning public or private undertakings. They are disgusted with muckraking, which usually is conducted for the glorification of the inquisitor and at a large expense to the public. This is especially true of the present, when sentiment is inflamed and when the burdens of taxation are almost intolerable.

"A word concerning the next President—the Captain of the Ship of State. There must be selected one who is able, wise and well-informed, of unquestioned honesty, morally and intellectually, eminently fair and impartial, frank and sincere, broad-minded, deeply sympathetic, courageous, sturdy and well balanced; and above everything else, loyal to the Constitution and the laws of the land.

"Other problems of magnitude, national and international, engage our attention at the present time, but those of highest importance relate to the life and safety of our Ship of State.

Conclusion

"We have reason to expect, and I firmly believe, that now and henceforth, more than ever before in our history, a spirit of unity will pervade and control the minds of all the citizens from the President down; that each one will recognize a personal responsibility to his country and to all its inhabitants; that strictest economy in expenditures and management, lowest costs, and proper compensation for faithful performance will be the universal sentiment; and that order, stability, advancement and prosperity will surely follow.

• • • Sail on, O Ship of State!
Sail on, O Union, strong and great!
Humanity with all its fears,
With all the hopes of future years,
Is hanging breathless on thy fate!
We know what master laid thy keel,
What workmen wrought thy ribs of steel,
Who made each mast, and sail, and rope,
What anvils rang, what hammers beat,
In what a forge and what a heat
Were shaped the anchors of thy hope!
Fear not each sudden sound and shock,
'Tis of the wave and not the rock;
'Tis but the flapping of the sail,
And not a rent made by the gale!
In spite of rock and tempest's roar,
In spite of false lights on the shore,
Sail on, nor fear to breast the sea!
Our hearts, our hopes, are all with thee,
Our hearts, our hopes, our prayers, our tears,
Our faith triumphant o'er our fears,
Are all with thee—are all with thee!"

Iron Industry in the War

Fully 100,000,000 Tons of Steel Used—Over 130,000
Men in Service—Immense Bond Subscriptions

JOSEPH G. BUTLER, Jr., Youngstown, Ohio, speaking on the iron and steel industries in war work and financing, said:

"The manner in which the whole American people responded to the call of country during the emergency arising from our entrance, with almost no previous preparation, into the most momentous struggle of all history, the world war of 1914-19, forms one of the

brightest pages in the record of democratic government. The part played in this inspiring evidence of national strength and solidarity by the iron and steel industries was not less noteworthy than their contributions to the cause of civilization in the form of products necessary to win the war.

"The amount of steel contributed to the combined armies and navies of the Allied countries during the

war cannot be stated with exactness, but a conservative estimate made from the latest information at hand places this at the stupendous figure of not less than 100,000,000 tons. Much of this was used indirectly for war purposes and a considerable portion of it consumed in this country. Nevertheless, it was a part, in one form or another, of the vast machine by which the war was won.

"Fortunately it is possible to present the facts concerning the contribution made by the iron and steel industries in the form of men and money more exactly than those in regard to the tonnage of steel supplied to our Government and its allies. The American Iron and Steel Institute sent out inquiries to its contributing membership of plants of all kinds. The replies embraced reports made by 568 steel companies in the United States, and include all except a comparatively few smaller concerns, statistics from which would not materially change the total.

"These statistics have been arranged in three groups. The first shows the number of officers and employees of the companies reporting who were engaged in the service of the United States and enrolled in regular organizations in the Army, Navy and Aviation Corps, together with the number who voluntarily engaged in auxiliary war work in various organizations approved by the Government. The second group gives the total subscriptions to Liberty loans made by officers and employees of these companies, arranged so as to indicate the nature of the securities and the amount of each taken by corporations and their employees wherever possible. The third group gives in detail for 56 leading companies the number of men in service, the amount of securities purchased by companies and by employees (or by both where this was not separated on the records), and the grand total of subscriptions and enlistments for these 56 companies and for all of the companies reporting, 568 in number.

"I am condensing these statistics. The figures in detail will appear in full in the 1919 Year Book of the American Iron and Steel Institute, reported soon to be published.

"It is worthy of note that in the group of 56 companies referred to above sent into the service more than 80 per cent of the total enlisting, and at the same time subscribed about 82 per cent of the total amount invested in war securities. This group included no companies subscribing for less than a total of \$2,000,000. More than 33 companies, in addition to these 56, purchased securities in excess of \$1,000,000. A striking fact in this connection is the report by all of the 56 companies mentioned that their employees were 100 per cent enrolled as purchasers of bonds during the war, as well as that the employees of some of the smaller companies whose detailed statement could not be included herewith because of the necessity of brevity, were among the largest buyers of both bonds and war savings stamps.

"These statistics given indicate that the iron and steel industries of this country contributed 131,504 men to the service of the country during the war, and supplied funds to the amount of nearly \$700,000,000 for the prosecution of the struggle. It is a matter of deep regret that no adequate records have been kept by the greater number of companies concerning the contribution made by them and their employees in funds for war work, such as the Red Cross, the Young Men's Christian Association, the Knights of Columbus and probably other organizations. Comparison of security purchases and war work contributions by companies and their employees in the relatively few cases where accurate figures on this point are obtainable, indicate that the amount furnished for these forms of activity by the steel industry was very nearly equally divided between the employees and the stockholders. Many claims are made as to who won the war. It is fair to say that American steel played a very important part. It is my intention to endeavor to obtain statistics showing the income tax and all other forms of taxation made upon and paid by the steel-producing interests. These figures will show the large sums exacted and possibly aid in the publicity very much needed to contradict the wild stories prevalent of the enormous profits made by the producers of steel."

"Beware of Germany," Says Professor Howe

Danger of Another Attack of the Prussians—Four Great Deterrents Described

PROF. HENRY M. HOWE at the banquet spoke as follows:

"Because we are the greatest and richest country we have the greatest interest, measured absolutely, in world welfare and world thrift, that our debtors may thrive and pay us and that our customers may thrive and buy. As a lending and selling nation we can prosper only as the rest of the world prospers and is able to repay and to buy.

"With this enormous stake in world thrift, we should be most unwise, now that we have once emerged into the world's forum, to retreat from it and resume our old Korean role of a hermit nation, not only neglecting to exert our force to direct the world according to our interests, but shirking the duties which every strong nation owes its fellows, as every strong man owes his community an active part in promoting the common welfare.

"With these truisms clearly before us, let us consider briefly a single group of the great world questions the right solution of which is of the first importance to us.

"Why did we go to war? To defend our own existence as a nation. We saw that Prussia, after expanding through centuries till she controlled the whole of the vast Central Empires, had so nearly conquered the Western Powers that, unless we helped them, they too would be absorbed, that our turn would come next, and that we, together with all our available allies, such as Japan and Latin America, would then be impotent to resist Prussia after she should have duly organized her approaching conquests. We saw at last that our

very existence was seriously threatened by the terrible law of the survival of the fittest—not the fittest industrially, intellectually, or ethically, but the fittest to conquer other nations. We may differ in our analysis of this fitness. We may say that it springs from her hereditary and insatiable lust of conquest; from her treachery; from her system of government which concentrates all the best intelligence of the country on war problems; from the natural cohesion of an autocracy which gives it an incalculable advantage over the individualism of democracies, or from these causes combined. But whatever the cause, Prussia's supreme fitness for conquest threatened us so closely that we poured out our blood and wealth like water, preferring death or poverty to bondage.

"For a few heroic months our people saw and fought the peril to our existence inherent in the nature of the Prussian. To-day we seem, ostrich like, to hide it by thrusting our heads in the sand. When Hannibal was at the gates, Rome threw herself upon Carthage and swept her from the face of the earth, recognizing the peril inherent in the nature of the Carthaginians. In the language of to-day, that means taking effective steps to prevent Hannibal and his successors from returning to the gates. In like manner it is of the first importance to us, both for our own national existence and for the welfare of the rest of the world, our debtors and customers, to prevent Germany's re-entering the warpath and reattacking our natural allies, lest she bankrupt them, and, absorbing their resources, human and material, in turn reach a strength which we should be impotent to resist.



AUTHORS OF PAPERS READ AT MEETING OF THE AMERICAN IRON AND STEEL INSTITUTE

From left to right, upper row: C. L. CLOSE, manager, Bureau of Safety, Sanitation and Welfare, United States Steel Corporation, New York; B. DE MARÉ, superintendent, open hearth department, Midvale Steel and Ordnance Company, Philadelphia; ALBERT SAUVEUR, professor of metallurgy, Harvard University, Cambridge, Mass.; F. C. COTTRELL, Bureau of Mines, Washington.

From left to right, lower row: GEORGE OTIS SMITH, director, United States Geological Survey, Washington; C. A. WITTER, Provident Engineering Co., Philadelphia; H. F. MOORE, research professor of engineering material, University of Illinois, Urbana, Ill.

"Therefore let us see clearly that, as Rome's peril lay in the nature of the Carthaginians, so ours lies in the nature of the Prussians, and that we are so profoundly interested in what is done to prevent their re-attacking that we owe it to ourselves to exert our influence. Let us not for an instant suppose that the war is a closed episode, nor shut our eyes to the persistence of that Prussian nature which, in the last analysis, caused the war, and retains to-day the determination to reattempt world conquest when a favorable time comes. Let us remember that it was our intervention alone that thwarted Prussia; that our allies are fearfully weakened by bearing the onslaught for years without our aid; that Germany may well succeed in getting such control over Russia that our own administrative genius may direct the immense resources of that unhappy land against the Western Powers and ourselves; that the situation thus remains and will remain critical; and hence that we should exert our influence to prevent effectively the coming of that time favorable to a German reattack. Among these preventive measures we at once recognize four so important that we, as a country interested in this prevention, should exert the influence which our strength and our fairness justify. These four deterrents are the punishment of the guilty, the reduction of the German armament, the guarding of the west bank of the Rhine, and a great indemnity in money and goods. Let us review these briefly.

"The trial and punishment of the guilty, originally assigned to the Allies, has been transferred to the Germans themselves. The influence of our public opinion should have been brought to bear on this question. To many of us this seems like deputing to Hannibal to explain to Carthage that to assault Rome was naughty, and that instead of a deterrent it was a strong encouragement, by assuring the Teutons in advance that we will pardon whatever enormities they commit, thus capitalizing for them their own treachery and brutality and freeing them to use every baseness to which we cannot descend.

"After the Germans had consented to reducing their army to a maximum of 100,000 men, without heavy artillery, tanks, war planes, poison gases or liquid fire, as things superfluous for maintaining domestic order, our public opinion should have expressed itself clearly as to whether this plan was to be abandoned and Germany allowed, as she is to-day, to have more than 1,500,000 men under arms, still equipped with heavy artillery, flame throwers, war planes, and tanks.

"The permanent occupation of the west bank of the Rhine, without annexation, would form a most important deterrent to German attacks, because the damage done by the attack would then occur in German territory, and because the Rhine itself is a great natural obstacle. Should German predatoriness later cease, this occupation might cease with it. The permanence of

this safeguard should not have been abandoned, as it has, without giving our people an opportunity to judge.

"The fourth great deterrent, a great indemnity in money and goods, should not be given up without consulting our people effectively.

"A strong school opposes any penalty commensurate with the damage, on the ground that Germany must be strengthened so that she may be able to pay. Our country as a country is interested in the deterrent feature of this indemnity, both in its making Germany impotent for a new attack and in serving as an example of the damage incurred by an unsuccessful attack. Those who are seeking to shield Germany may forget that the nursing which gives her strength to pay gives her also the strength to reattack, and that a great

indemnity would probably have the beneficial effect of causing many of the most enterprising Germans to emigrate, and thus to lessen Germany's power for harm, without lessening the usefulness of any individual emigrant. In the decision of this and like matters we are so profoundly interested because they bear so strongly on Germany's tendency to reattack, that we ought to exert great weight.

"You may say that such details should be left to our representatives. Even so, our people should be enabled to exert their influence on the basic underlying decision between coddling and sternness, between restoring to the thug his strength with which to repay us or reattack us as he sees fit, and visiting on him a just penalty for his crimes."

THE TECHNICAL PAPERS PRESENTED

ABSTRACTS of the papers presented at the sessions follow, excepting the one on "The Future of Oxygen Enrichment of the Air in Metallurgical Operations," by F. C. Cottrell, Bureau of Mines, Washington. This will appear in a later issue together with its discussion and the discussions of the other papers.

Industry's Need of Oil

American Resources and the World's—Our Consumption and Safeguards for the Future—Relation to the Steel Industry

—BY GEORGE OTIS SMITH*

IN the last 10 years the natural inclination of mankind to trust to the largess of nature has found abundant incentive. In the summer of 1910 the Lakeview Gusher, in California, excited popular interest with its flow of 40,000 bbl. a day, but just before the close of the same year this record was surpassed by that of a well in Mexico, the Potrero del Llano, No. 4, with a maximum flow of about 160,000 bbl. a day, yet even this outburst of oil was exceeded five years later by another Mexican well, the Cerro Azul No. 4, whose measured flow was more than 260,000 bbl. in 24 hr. These individual performances, together with the strikes at Cushing and Healdton, Okla., and the later oil booms in North Texas and Louisiana, all have increased the popular faith in the inexhaustible supplies of petroleum.

Ten years ago the wells of the United States were adding to our reserve stocks 15,000,000 bbl. in the year; now the current is in the other direction, for in the last nine months our stored petroleum has been drawn upon to the extent of 15,000,000 bbl. In 1910 our imports of oil were an insignificant item, but in 1919 we were obliged to import nearly 47,000,000 bbl. of crude oil more than we exported. Ten years ago Mexico was our customer for crude oil as well as for refinery products, but now we realize too keenly our dependence upon the Mexican wells; without the 6,500,000 bbl. imported from Mexico in March our present situation would be indeed critical.

In terms of oil, then, the decade 1910-1919 is best described as a transition from over-supply to over-demand. And figures already available indicate that in both production and consumption the present year promises a record that will further emphasize this discordance between supply and demand. The first three months of 1920 have established a rate of domestic production that if unchecked will mean a total for the year of 415,000,000 bbl., or nearly twice the output of 1910, and a rate of consumption that would make the year's requirements more than 490,000,000 bbl., or one-seventh more than last year's consumption.

Consumption of Oil

Facts of consumption are not easily determined. Where our oil comes from is a matter set forth each month in our Geological Survey reports; where it goes is largely a matter of conjecture. We all know in a

general way the different kinds of demand. Foremost among these is the ever-increasing thirst for gasoline by the automotive engine, whose name is legion; next is the larger use of fuel oil for steam making; then the universal need of all industry for lubricants; and finally, the many other uses for petroleum products, not less important, perhaps, though involving less volume, unless we except the accumulated demand for asphaltic oils for road construction. If every demand for oil cannot be met, which use is to be given priority?

The first official note of warning that demand was overtaking supply was sounded a dozen years ago, but only within the last few months has that note swollen into a chorus, and the reason for this chorus of alarm is evident. Rising prices have led to the rediscovery of the law of supply and demand, which was supposed to have been repealed during the war; a consumption curve that rises faster than a production curve is the graphic signal of danger ahead; the heavy draft now being made upon our accumulated stores of oil—more than 10 per cent gone in nine months—tells the story that we are living beyond our means; and it all leads us to ask ourselves, in this day of apparent plenty, where will our children get the oil they need? An intensive drilling campaign has been the practical response to high prices for crude oil, just as the orgy of newspaper advertising of questionable oil stocks is the reflection of popular interest in the petroleum situation, but even the most wisely directed drilling can give only temporary relief. How soon we may expect the peak of domestic production becomes a very practical question, inasmuch as no one can see any prospect of any let-up in demand.

The official estimate of less than 7,000,000,000 bbl. of oil as the quantity remaining available in the ground in the United States is believed to be liberal, but even if we inflate such an estimate 25 per cent the indicated reserve is seen to be far from ample when we contemplate our probable consumption this year of nearly half a billion barrels of crude oil. The division of ultimate domestic supply by current demand is all too simple a sum in mental arithmetic.

World's Oil Resources

An estimate of the petroleum resources of the world has just been published by the Chief Geologist of the U. S. Geological Survey, David White, and his figure of 60,000,000,000 bbl. for the whole world is doubtless exact enough to enable us to see the oil situation of the

*Director, United States Geological Survey.

United States in fairly true perspective. Using within our own borders fully half of the world's annual production of petroleum, we seem to possess only about one-seventh of what remains. This lack of national self-sufficiency in oil reserves may be expressed in another way; contrast the international position of the United States in respect to oil with its position in respect to coal. In the past 10 years our 6000 to 7000 coal mines have contributed 41 per cent of the world's output of coal. Our present estimates credit the United States with more than half of the world's coal reserves, so that if we are to think in world terms, the great tonnage of coal produced by this country each year represents less than our national share. But now consider the petroleum situation: in these same 10 years our 140,000 to 200,000 oil wells have poured forth more than 61 per cent of the world's output, although we now believe that the United States possesses only about 12 per cent of the oil left to the world for its future use, so that in oil our nation is doing far more than its share.

Coke By-Products Limited

When we come to consider substitutes for petroleum products, the capacity of your own steel industry for furnishing benzol and alcohol as by-products deserves first mention. I am informed by Mr. Walker of the United States Steel Corporation that plants now in operation and under construction have a capacity of 95,000,000 gal. a year—that is, if the output of light oils is converted into motor benzol. Such an annual contribution of less than 2,000,000 bbl., however, is equivalent to not much more than a week's output of gasoline as the refineries of the United States are now running. The recovery of alcohol from your coke ovens has not yet begun, but British experience seems to show that the maximum alcohol capacity of the coke ovens of the United States might be less than their benzol capacity. Apparently, then, the benzol and alcohol possibilities of the steel industry cannot be regarded as promising enough motor fuel even to meet the present increase in demand. It must be recognized, however, that this country, as the world's greatest consumer of coal, has not fairly begun by-product recovery. With the higher cost of coal and this increased demand for by-products more efficient practice must result in the natural course of economic events.

The oil-shale resources of our country must not be overlooked nor their national value underestimated as a rear line of economic defense. As their oil content is fairly comparable with the petroleum reserves of the world, these shales furnish an effective guaranty against the United States going bone-dry as to oil, but the oil won from oil shales will not be labor-cheap like the petroleum now flowing from our wells. As long as industry is short-handed it cannot look for relief from oil shale nor can it expect any return to low prices by utilizing this resource, however vast its extent; yet these Western mountains of oil-shale stand as a visible promise that even when our underground reservoirs of petroleum are drained the United States will not be at the commercial mercy of any foreign power—not even if that power has been prompt to take advantage of the present opportunity to acquire a majority share in the world's oil resources. Still, even with the largest measure of optimism, backed up with our oil shales, we must face the contingency that the next generation of American business men may see their trade rivals across the Atlantic turning the wheels of industry and commerce with cheaper oil than is available in the American markets. Regard for the future, then, forces us to plan how to use less oil at home and how to acquire our share of the foreign supply.

Essential Uses of Petroleum

It is high time for us to begin to weigh the essential uses of petroleum. Oil was first used as an illuminant, but to-day, whether in the kerosene lamp on the modern frontier or as gas-oil to enrich the gas of the city, this use of a petroleum product is not increasing on the same scale as the industrial uses. In power generation oil takes on much larger economic values, whether as gasoline or as fuel oil. The demand for

gasoline seems to obey no law of normal increase, and the higher cost of coal in recent years has greatly stimulated the use of fuel oil under steam boilers. Fortunately the rapid increase in the consumption of fuel oil by locomotives seems to have been checked at about the same time that it has found a wider use in stationary steam plants. Last year the public utility power plants of the United States consumed 11,000,000 bbl. of fuel oil in generating electricity, nearly half of it in coalless California. In the East the present oil shortage has doubtless started a reaction in the popularity of fuel oil caused by the coal shortage in the war years. The more adequate and reliable supply of coal must in the long run give coal the advantage for use under stationary boilers, for despite the labor economy attained through oil, the assurance of an unfailing supply of fuel is of first importance in industry.

Prices also will eventually exert an automatic control on the use of oil products. Not only is the inadequate supply stimulating high-cost production as well as rewarding low-cost operation with unusual profits, but however much we may desire low-priced gasoline we cannot wave aside the economic facts of supply and demand. High prices are here for crude oil and for every one of its products, and high prices will help to bring about a kind of economic survival. The more essential use of oil—that is, the use of oil where it serves the greatest end—will survive, and business practice, public opinion, and even, if needed, Governmental regulation, should work together to enforce obedience to this democratic rule of the greatest good to the greatest number. Plenty and cheapness have led to waste; scarcity and dearth ought to promote thrift. It is a problem for the nation as well as for your individual plant to get larger values out of the higher-cost coal and oil.

Electricity as a Substitute for Oil Fuel

In any weighing of the uses of petroleum, certain changes in practice appear inevitable. The use of gasoline to serve our pleasure cannot go on unchecked—the joy ride is not the kind of "pursuit of happiness" regarded as an "unalienable right" by our revolutionary fathers. The use of fuel oil as a substitute for coal must be discouraged, for our Navy and our merchant marine need the fluid fuel for reasons that do not apply to stationary boilers or even steam locomotives. On terra firma a power program can be worked out that will hitch up coal mine and waterfall efficiently, and both industry and transportation can be fully electrified to the end that, except perhaps on the Pacific coast, not a barrel of oil should be used under boilers. The necessity of caution in enlarging the field of fuel oil is the more apparent when we realize that, as suggested by the Bureau of mines, every increase in demand for other petroleum products for a higher use entails a loss in the percentage of fuel oil produced.

The requirements of the American Navy and the new merchant marine present a priority demand of the first order. Admiral Griffin, the chief of the Bureau of Steam Engineering of the United States Navy, informs me that the oil-burning vessels ready for service aggregate more than 6,000,000 hp. and that other vessels under construction will bring this total up to nearly 9,000,000 hp. The Navy now needs 8,000,000 bbl. of fuel oil a year, yet this figure is small compared with the requirements of the Shipping Board, which are stated by Paul Foley, its director of operations, as 40,000,000 bbl. for 1920 and 60,000,000 for 1921. If the American flag is to fly on the seven seas the motive power to carry it must be assured, and here is one demand for fuel oil which alone equals the present output of our refineries for about four months. Surely no American with vision wishes to contemplate even the possibility of a shortage of fuel oil that would endanger the immediate availability of these battleships, cruisers and destroyers or interfere with the successful operation of the steamers in the construction of which our nation has invested so many millions.

Use of Power and Machinery Increasing

In our attention to the generation of power to meet the needs of industry and transportation, we give too

little thought to one unique function of oil—that of saving power. Machinery without lubrication is unthinkable; adequate lubrication saves energy and makes it available for use as well as adds to the life of the machine. There is little danger of shortage in lubricating oil for our Navy, for the daily refinery output, as reported by the Bureau of Mines, is almost sufficient to supply the Navy for a year with lubricating oil, whereas about three weeks run would be necessary to meet the Navy's annual needs in fuel oil. Yet, on second thought, we realize how universal is the use of lubricating oil, in the home as well as in the largest steel plant, in the motorcycle and locomotive, in the electric fan and the power station—everywhere oil is needed in the bearings, a single drop or many gallons. And in looking to industry's future needs of this petroleum product large plans should be made, for our use of power and machinery is increasing faster than is generally appreciated. The statistics of electric power generation collected monthly by the Geological Survey

show that the war-peak was exceeded last year, and already the opening months of 1920 are ahead of the corresponding months of 1919 by 14 per cent.

This need for oil to insure our industrial life inspires the call for pioneering on other continents by American oil companies. In the world estimates we credit South America with a third more oil reserves than the United States, so that one guidepost for the explorer and developer plainly points to the south. To the steel industry, this American hunt for oil, not only in the Western Hemisphere but in the Far East, has special significance. Wherever an oil field is developed by American capital not only will its product be available either for our home refineries or for the more distant American bunker stations at the world's crossroads, but all the supplies needed to develop and operate this foreign oil field will come from the United States. An "International Oil" operating in South America means another market for the product of a "National Tube" operating in Pennsylvania.

The Microscope and the Heat Treatment of Steel

The Various Transformations in Structure and Properties
Under Thermal Conditions—Indispensability of Metallography

—BY ALBERT SAUVEUR*

IN no department of metallurgy has the microscope rendered greater service than in the heat treatment of steel. No satisfactory explanation can be given of the heat treatment of steel without having recourse to the microscope. It is indispensable also to further progress in the art of treating steel.

It would be difficult to find a contribution written within the last 10 years in any of our technical transactions on the subject of the heat treatment of steel which is not based in part, if not wholly, on the teaching of the microscope. The reason for this is obvious. If the heat treatment of steel is of such vastly greater importance and significance than the heat treatment of any other metal or alloy, if it implies a vastly greater number of possible treatments and of possible results, it is because steel, unlike other metals and alloys, undergoes on cooling (and, on heating) considerably below its melting point, momentous transformations which it is possible, at will, to arrest at any desired stage, thereby conferring to the metal an almost infinite number of combinations of physical properties to meet our requirements. Were it not for the microscope we would be in almost complete darkness as to the nature of these transformations and as to the extent to which a given treatment has permitted them to proceed.

The chart may visualize these transformations as well as results obtained by various heat treatments. For the sake of simplicity the steel considered is assumed to be of eutectoid composition, that is, to contain in the vicinity of 0.85 per cent carbon and free, therefore, from excess ferrite or cementite. It is well known that when such a steel is allowed to cool slowly it exhibits a marked thermal critical point at about 700 deg. C., resulting from a spontaneous evolution of heat at that temperature, and it is also well known that on cooling through its critical point this steel, which at higher temperature consisted of a solid solution of carbon in iron (austenite), is now converted into an aggregate of iron (ferrite) and the carbide of iron, Fe₃C (cementite) the resulting intimate mechanical mixture of these two components being called pearlite.

Austenite, however, is not abruptly converted into pearlite on reaching its critical point. The transformation is gradual, three stages at least being recognized as marking as many steps in the transformation. These stages correspond to readily distinguishable structures. They are often referred to as "transition constituents," and are called respectively martensite, troostite and sorbite. This gradual transformation of austenite into

pearlite is shown in the chart. If the cooling be sufficiently slow, the transformation is complete and the steel becomes pearlitic, a condition which imparts to it maximum softness and ductility and minimum tenacity.

By hastening and regulating the rate of cooling it is possible to prevent the full transformation of the steel; indeed it is possible to arrest that transformation at any desired stage in accordance with the set of physical properties desired. This partial suppression of the transformation is made possible by the lowering of the critical point, that is, of the temperature at which the transformation takes place.

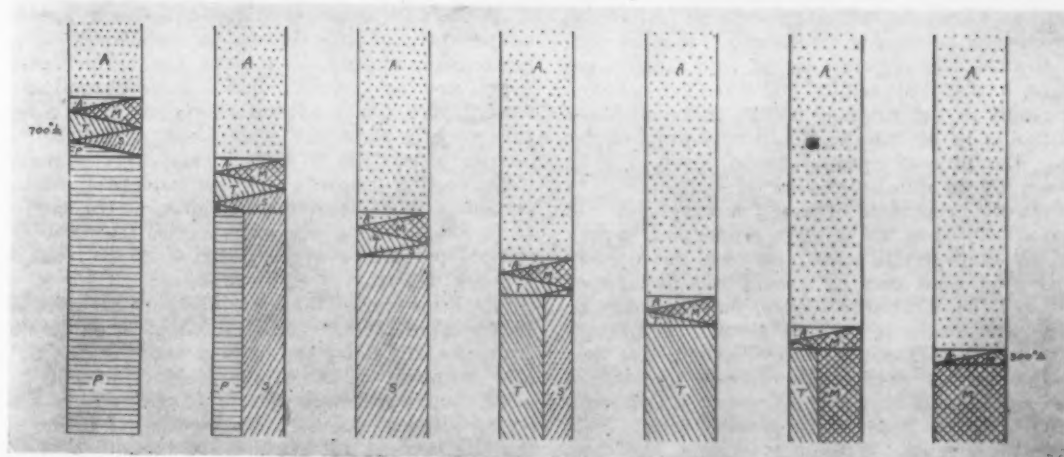
In other words, the faster the cooling the lower the temperature of transformation, and the lower that temperature the more incomplete the transformation. If by the very rapid cooling involved in quenching steel the critical temperature remained at 700 deg. C., the steel would become pearlitic and the hardening of steel, therefore, would not be possible. Quenching steel for hardening, however, lowers the transformation temperature to about 300 deg. C., and at that low temperature it is possible for austenite to be converted into martensite only. The transformation is then arrested, the steel remains martensitic, and hence becomes intensely hard.

It has been attempted to indicate in the chart the influence of the rate of cooling on the position of the temperature of transformation, and second, the influence of the position of the temperature of transformation on the amount of transformation taking place. The critical point has been represented in each case by a set of two parallel horizontal lines in order to make it possible to indicate the progress of the transformation as the metal cools through this point. Seven rates of cooling are depicted yielding respectively pearlite, pearlite-sorbite, sorbite, sorbite-troostite, troostite, troostite-martensite and martensite. It is well known that it is not possible to prevent altogether the transformation of carbon steel, that is, to retain it in its austenitic condition, the fastest rate of cooling producing martensite.

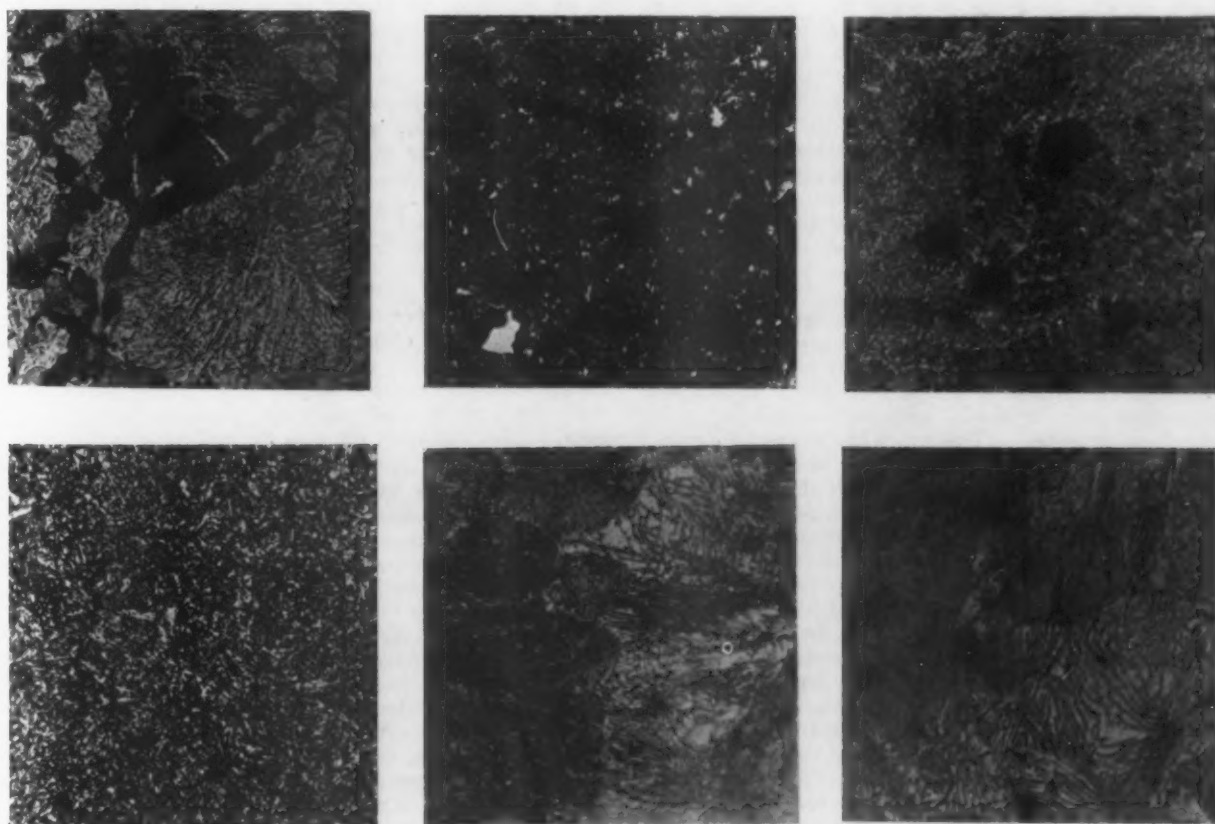
From the chart we naturally infer that in order to produce pearlite-sorbite steel the metal should be cooled at such a rate as to lower its critical point to about 625 deg. C., while to obtain sorbitic, sorbito-troostitic, troostitic, troostite-martensitic or martensitic steel, the cooling of the metal should be conducted with increasing rapidity.

It should be borne in mind, however, that while it is known that when the transformation takes place at 700 deg. C. the steel becomes pearlitic, whereas with its transformation lowered to 300 deg. C. it becomes martensitic, it is not claimed, for obvious reasons,

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Graphic Chart of the Changes Taking Place in Steel on Heating and Cooling. The photomicrographs are representative reproductions of austenite, austenite and martensite and martensite in upper row; martensite and troostite, troostite, troostite and sorbite in second row and sorbite, sorbite and pearlite and pearlite in third row



that the temperature of transformation corresponding to the various structures described is accurately indicated in the diagram. The aim is to depict the mechanism of the critical transformation of the steel and the relation existing between the three factors, rate of cooling, position of the transformation temperature and degree of transformation. [Dr. Sauveur here discusses

Portevin and Garvin's theory of the critical speed of quenching.]

The structure of steel depends primarily upon the extent of the transformation which in turn depends upon the temperature at which that transformation takes place. Sorbite is more tenacious, harder and less ductile than pearlite; troostite is more tenacious,

harder and less ductile than sorbite; martensite is more tenacious, harder and less ductile than troostite. When maximum softness and ductility are needed, therefore, the treatment should be of such a nature as to permit the steel to become pearlitic, which in turn implies a transformation at about 700 deg. C., hence, slow cooling. Such treatment is generally known as annealing.

To produce greater tenacity and elastic limit with reduced ductility although retaining freedom from brittleness, the metal should be made sorbitic through a suitable rate of cooling, by which the position of the critical point will be sufficiently depressed.

To produce great hardness, necessarily accompanied by little ductility, if not by brittleness, the steel should be made martensitic or troostite-martensitic, which implies cooling at such rate that the temperature of transformation is lowered to about 300 deg. C. These three basic treatments may be called respectively softening, strengthening and hardening treatments. It is obvious that the gradual transformation of one constituent into another, as for instance, of martensite into troostite, may result in the presence in the metal of these two constituents in an infinite number of proportions, hence, that the physical properties of steel may be made to vary by an infinite number of steps.

The physical properties of steel, however, do not depend exclusively upon the relative proportions it may contain of the micro-constituents mentioned above; they also depend upon what may be termed "the fineness of the structure." In other words, steel may be finely or coarsely pearlitic, finely or coarsely sorbitic or martensitic, when it will be found in nearly every case that the finer structure is preferable. Hence, the desirability of producing not only the necessary constituents but of obtaining them in the finest possible form. This is why, for the purpose of heat treatment, the steel should not generally be heated to a temperature much above its critical range.

Again, in steel so generally, although vaguely, described as "heat treated" the aim is generally to produce a sorbitic condition in order that the metal may be highly tenacious, but this condition is not as a rule imparted by a single cooling through the range at the proper rate, because such treatment, while producing sorbite, will not yield it in a sufficiently fine condition. It is preferable to have recourse to an indirect treatment consisting in first producing martensite through a faster cooling and then in transforming that constituent into sorbite by a so-called "drawing treatment," because the very fast cooling needed to produce martensite implies a finer structure, and this fineness of structure is retained when martensite is tempered into sorbite.

Passing now to alloy steels, metallographic methods of investigation again supply the key necessary to understand the remarkable properties of some of these alloys and the influence of heat treatment. It has been found that some elements such as manganese, nickel, chromium, tungsten and others when alloyed with iron and carbon yield results to which these alloys owe their great industrial importance. It may be asserted that were it not for the marked influence of these elements in lowering (or raising) the position of the temperature of transformation they would have comparatively little, if any, influence on the physical properties, and alloy steels, therefore, would be of little importance.

If manganese steel, for instance, had its transformation temperature on slow cooling at the ordinary temperature, or in the vicinity of 700 deg. C., the steel would become pearlitic on slow cooling and would not, therefore, differ materially from ordinary slowly-cooled carbon steel. Manganese, however, lowers the point of transformation, causing that transformation to take place at gradually lower temperatures, and therefore causing the steel to assume on slow cooling the various structures described above and which in carbon steel can be obtained only, if at all, by increasing the rate of cooling. When, for instance, a sufficient proportion of manganese or nickel has been introduced to lower the temperature of transformation to some 300 deg. C., the steel, although slowly cooled, becomes martensitic. Indeed, with some of these elements it is possible to

prevent the transformation altogether, retaining the steel in its austenitic condition. Obviously in such cases no thermal critical point occurs above room temperature. The influence of some of the alloying elements, therefore, is to produce, after slow cooling, structures which in carbon steels can be obtained only by rapid cooling (quenching), if at all. The advantage of obtaining sorbitic or martensitic structures without having recourse to quick cooling is obvious because of the inherent dangers of the quenching bath.

To clarify: Steel to become martensitic must have its transformation lowered to some 300 deg. C. This can be accomplished in carbon steel (provided enough carbon be present) by quenching, while in some alloy steels it is produced through the addition of a sufficient amount of the special element without the necessity of quenching. Such steels are frequently referred to as air or self-hardening steels.

A third factor is sometimes effective in lowering the temperature of transformation sufficiently to produce martensite, namely, increasing the temperature from which cooling begins. Some nickel-chromium steels, for instance, which after slow cooling from a temperature slightly above the normal position of their critical point are pearlitic or sorbitic, may become martensitic if the cooling proceeds from a considerably higher temperature. It is observed then that, as the temperature from which cooling begins increases, the position of the critical point is lowered until, when it reaches some 300 deg. C., martensite is produced.

In some cases the normal thermal critical point occurring in the vicinity of 700 deg. C. on slow cooling from slightly above the critical range seems to gradually disappear as the temperature from which cooling begins increases, while a new point occurs in the vicinity of 300 deg. C., increasing somewhat in intensity as the temperature from which the metal cools increases. This is what happens in the heat treatment of high speed steel. It remains true, however, that steel becomes martensitic whenever the temperature of transformation is lowered to about 300 deg. C., whether this be accomplished by quenching or through the influence of the special element or elements assisted or not by increasing the temperature from which cooling begins.

In regard to the formation of martensite, steels therefore may be divided into the following classes:

Water hardening steel, or those steels which in order to become hard must be quenched in water, as, for instance, medium high carbon steels.

Oil hardening steel, or those steels which become hard after quenching in oil, as, for instance, high carbon steels.

Air hardening steel, or those steels which become hard after air cooling, as, for instance, some nickel-chromium steels, some nickel steels, some manganese steel, etc.

Furnace hardening steel, or those steels which become hard even after very slow cooling in the furnace, as, for instance, some nickel and some manganese steels.

Air hardening and furnace hardening steels are sometimes called self-hardening steels.

The question may well be asked, however, whether the martensite formed under these different cooling conditions should be identical in structure and physical properties, seeing that this constituent may have formed (1) very quickly on water quenching, (2) more leisurely on air hardening, or (3) very leisurely on furnace cooling. Indeed, it is apparent that martensite produced on slow cooling is more stable than the same constituent obtained by rapid cooling. Carbon steel, for instance, made martensitic by quenching can be readily tempered and softened, while self-hardening steel made martensitic by slower cooling requires prolonged heating to some 600 to 675 deg. C. to be softened. This is why some of these self- or air-hardening steels were used successfully as cutting tools before the introduction of high speed steel. They could be used at greater speed than quenched carbon steel without losing their cutting edge through the tempering action of the heat of friction. Their martensitic condition was more stable. Furnace hardening steels which be-

come martensitic after furnace cooling should retain their cutting edge when heated to still higher temperature and should therefore possess some of the essential properties of high speed steel.

Obviously then, the condition of any hardened steel is the more unstable—that is, it yields the more readily to tempering and drawing, not only the more incomplete its transformation but also the faster the cooling that produced this partial transformation. To illustrate—martensitic carbon steel is more unstable than the same steel in a troostitic condition because it is less completely transformed. Martensitic air hardening steel is more stable than martensitic carbon steel because the martensite of the former resulted from a slower rate of cooling.

The microscopic study of steel has made possible improvements and refinements in the heat treatment of the metal which could not have been accomplished without its aid. It seems hardly necessary to call the attention of the members of the institute to the important part played by the microscope in those plants where steel must be subjected to careful heat treatment, as for instance, in the manufacture of automobiles, aircrafts, etc. It has made possible that reduction in weight so essential in those constructions, a reduction which can be obtained only by so treating the different parts as to obtain maximum properties for each pound of steel used. Employees from these plants have sought instruction in metallography by the hundreds, if not by the thousands.

The Acid Open Hearth Process

Superior to Basic for High Grade Steel—Design of the Acid Furnace—Oil Fuel Better—Use of Aluminum and Titanium

BY B. E. L. DE MARÉ*

IN presenting this paper my aim has been to confine myself to the practice as carried out in the open-hearth department of the Nicetown Plant of the Midvale Steel and Ordnance Co., and to state the conditions which experience there has shown to be most conducive to the successful manufacture of high grade acid open-hearth steel.

In a broad sense, any steel, which in a perfectly satisfactory manner serves the purpose for which it is intended, may be considered high grade. In the more narrow sense, however, in which it is here used, it may be defined as a steel which, to be accepted, must pass certain more than ordinarily severe tests, where

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the margin between success and failure is so narrow and the financial loss by failure so great, that the steel maker is not only justified, but compelled, to leave nothing undone which in any possible way may improve the quality of the steel, regardless of quantity or of any reasonable increase in its cost of manufacture in order to insure a high percentage of acceptance when the steel is finally submitted to the test.

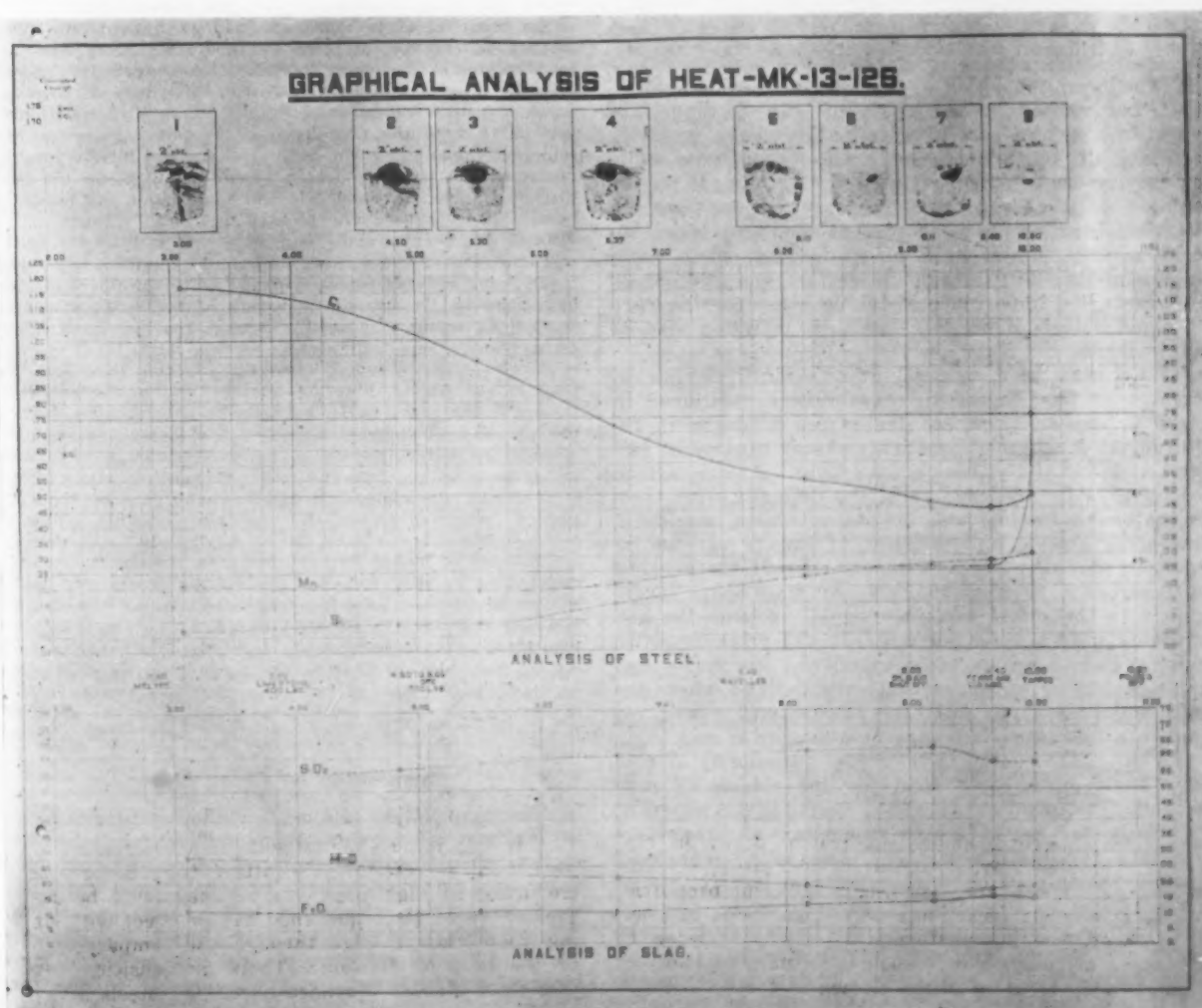
The more important products of acid open-hearth steel, manufactured by Midvale, are as follows:

Armor-piercing projectiles.

Gun forgings, especially of large calibre.

Large or intricate forgings.

Forgings which require a hard and polished surface without flaw or blemish, such as hardened rolls.



Special grades of bar steel.
Locomotive and car wheel tires.

The order in which the above classes have been enumerated may be considered as indicating the relative severity of the acceptance tests they have to pass, and, therefore, the relative degree of quality required.

The test required for the acceptance of projectiles is as follows:

From each lot of 500 projectiles, four are selected to be fired against a face hardened armor plate at a certain velocity and angle of impact of which two must pass through the plate and remain in effective bursting condition. Should this test be a failure, four more projectiles may be selected and fired, of which three must pass through the plate and remain in effective bursting condition. In the case of 16 in. shells, the cost to the contractor of this second test would amount to about \$20,000. Should it fail, the whole lot of 500 projectiles may be condemned or the contractor may be permitted to retreat it and re-submit it as a new lot, which would entail an extra expense of approximately \$100,000. It is thus evident that every possible attention must be paid to the quality of this steel, in order to avoid great financial loss, as well as loss in reputation.

The chief test for acceptance of gun forgings are the tangential test bars taken from the breech and muzzle ends of the rough machined forgings. As specified, these shall be located with their axes in planes perpendicular to the major axis of the forging and also with their axes perpendicular to the radii, which pass through the middle points of the lengths of the bars, and for larger gun forgings are to be taken, one from the outer, two from the middle, and one from the inner section of wall at each end of the forging. The contractor will be allowed three official tests only. Where the test specimens fail to meet the requirements on the third submission, the piece shall be finally rejected, with certain exceptions.

The minimum physical qualities of nickel steel gun forgings of 3-in. calibre and above are as follows:

	Tensile Strength, Lb. Per Sq. In.	Elastic Limit, Lb. Per Sq. In.	Elonga- tion, Per Cent	Contraction, Per Cent
Tubes and liners..	90,000	55,000	18	30
Jackets	90,000	60,000	18	30
Hoops	95,000	65,000	18	30

Other causes for rejection of gun forgings are ghostlines, where careful examination shows any lack of continuity of the metal, slag pockets and sand splits or cavities containing particles of slag, etc., if, in the opinion of the inspector, they are serious enough. Bearing in mind that the present standard 16-in. 50-calibre navy rifle is built up of forgings made from ingots up to 63-in. octagon in section and 200,000 lb. in weight, the importance of taking every possible care to avoid defects liable to cause their rejection may be appreciated.

What has been said of gun forgings applies in greater or less degree to the forgings mentioned in class 3, especially where transverse strength is required, as determined by transverse or tangential test bars.

As regards hardened rolls, the difficulty with them is that after having been forged, annealed, machined, hardened, ground and polished, if then a careful inspection should reveal any imperfection in the polished surface, such as a small oxide or slag spot, hardly visible to the naked eye, this would condemn the roll as being unfit for its purpose. In the remaining two classes, special grades of bar steel and locomotive and car wheel tires, we approach the borderland where the acid and basic open hearths compete and where, except in a few cases, it is largely a matter of cost.

What is the reason then for the superiority of acid over basic open-hearth steel for the classes of steel products just mentioned? That it actually is superior, especially for any forgings depending on transverse test-bars for their acceptance, has been repeatedly proven, not only by our own experience but by that of many others in this country as well as in England and France. Every attempt, for instance, to make heavy ordnance of basic open-hearth steel has from all accounts resulted in nothing but failure. The reason for this is that the quality of the steel is measured

by its freedom from oxides, and that acid open-hearth steel is more free from these oxides than basic steel, because acid open-hearth slag is more effective than basic slag by its reaction with the steel to de-oxidize it. Of course, there is no open-hearth steel, acid or basic, absolutely free from oxides, nor is there any other steel, no matter by what process made, which under the microscope does not show oxide spots.

Therefore, oxidation is only a matter of degree, and the various processes overlap, so that a badly melted steel, by whatever process produced, may be worse than a well melted steel produced by any of the other processes. Therefore, when the claim is made that acid open-hearth steel is better than basic, this holds good only in so far as full advantage has been taken of the fact just mentioned in regard to acid slag, as compared with basic.

Effects of Degree of Oxidation

The effect on the ingot metal of this difference in the degree of oxidation may be shown by the following facts:

The amount of de-oxidizing finals, just sufficient to produce an acid ingot free from blow holes, is not sufficient to make a basic ingot of similar composition solid, but will leave it decidedly blowey. For instance tire-ingots, which are sliced in laths into several blocks, and where therefore any lack of solidity in the ingot would be discovered, as the blocks are always carefully inspected just for such a defect, have proven beyond doubt, that basic tire-ingots are much more liable to be blowey than acid, and that it is absolutely necessary to add more de-oxidizing finals to basic than to acid heats, in order to make basic ingots as free from blow holes as the acid ones. This proves that basic steel is more oxidized than acid steel. Consequently the greater the amount of finals required for de-oxidizing the basic steel, reacting with the greater amount of oxides in the steel, will produce a greater amount of the non-metallic impurities resulting from this reaction, chiefly silicates of manganese.

The ingot crystals of basic steel as shown by tire ingots, as well as by numerous experiments with other grades of steel, are very much larger than those of acid steel, poured under the same condition. For this reason, and also because basic steel is more oxidized than acid, the finely divided oxides, still retained by the crystallizing steel and to a greater or less degree expelled by the growing crystals into the inter-crystalline space, will thus form in the basic ingot a honeycomb of non-metallic impurities much more serious than in the acid ingot. The ferrite envelope surrounding the ingot grain, which marks the inter-crystalline space as the ingot is cooled down, will also be far more distinct in size and outline in the basic ingot and harder to break up by subsequent forging and heat treatment, but even if this be eventually done, the non-metallic impurities will still remain and seriously affect the quality of the steel.

To bring out additional evidence as to the effect of ingot impurities on the internal structure of the ingot, a longitudinal cross section may now be finished, machined and etched. As a result, there will appear certain dark lines symmetrically disposed on either side of the center line, and running in an oblique direction inwards and upwards. These lines are the paths taken by metallic segregations, high in phosphorus and sulphur, mixed with silicates and sulphides of manganese, resulting from the reactions in the steel after it has been poured into the mold. These impurities remain fluid during the time of crystallization, part of them becoming entangled among the ingrowing crystals, while the rest are driven inwards by the solidifying shell and upwards on account of being lighter than the surrounding mother metal, and as they progress toward the center and top of the ingot, they coalesce into larger and larger globules and increase more and more in number. They may later be identified in the forging made from the ingot, the metallic segregations high in phosphorus and sulphur as ghost lines, especially in the bore of hollow forgings and the silicates of manganese as slag pockets or sand splits in the machined forging, and also as streaks of slag across transverse test bars.

Composition of Ghost Lines

The composition of the ghost lines was determined at Midvale some years ago by slicing a transverse section off the end of a large hollow forging made from an ingot which had been cast in a sand-lined mold and which, therefore, had a great many well defined ghost lines in the bore. On etching this section, the ghost lines were plainly seen as bright spots, increasing in number from the outside to the bore. These spots were drilled with a 3/32-in. drill, and

the drillings, as well as the surrounding metal, analyzed with the following result:

	Carbon, Per Cent	Manganese, Per Cent	Phosphorus, Per Cent	Sulphur, Per Cent	Silicon, Per Cent
Ghost lines	0.497	1.026	0.082	0.116	0.268
Surrounding metal....	0.498	0.894	0.030	0.047	0.316

In regard to the silicate of manganese opportunity was offered for its analysis by finding a large quantity that had escaped to the bottom of the shrinkage cavity in a 63-in. octagon ingot of basic steel, which had had the usual finals for this kind of steel of ferro-manganese, ferro-silicon and aluminum. The lower part of this silicate was a yellow-blue, solid enamel, while the upper part was very light and porous, violet-blue and black in color. The compositions were as follows:

	SiO ₂ , Per Cent	MnO, Per Cent	Al ₂ O ₃ , Per Cent	FeO, etc., Per Cent
Lower part.....	51.60	40.60	7.88	trace
Upper part.....	50.34	29.94	18.90	trace

The defects in the steel, resulting from these lines of ingot impurities, will be necessarily more serious in basic steel than in acid, especially in regard to the oxides. The much less serious effect of the segregations high in phosphorus and sulphur, which are the cause of ghost lines, may be modified in basic steel because of the fact that this, as a rule, is lower in phosphorus and sulphur than acid.

Having explained what in my opinion are the defects caused by oxides on the internal structure of the ingot and, therefore, the advantage of the acid open hearth over the basic in being able to produce a steel more free from these oxides, permit me to take up in order:

Proper design of the furnace for high grade acid open-hearth steel.

Comparison between producer gas and fuel oil for melting.

Analytical description of the acid open-hearth process as carried out by Midvale.

Acid Open-Hearth Furnace Design

There are two designs of open-hearth furnaces (shown by drawings), one as adapted for producer gas and the other for fuel oil. The nominal capacity of both is 50 tons, although charges up to 140,000 lb. may be melted. There is nothing peculiar in the designs, as far as valves, flues, regenerative chambers or stacks are concerned. The only unusual feature is the great height of the furnace roof over the door sill level. This has been a gradual development and has been found advantageous on account of the high and long sustained temperature necessary to carry out the chemical reactions during the de-oxidizing period of the process. The high roof provides a large combustion chamber, which permits a full and free development of the flame, and at the same time avoids damage by the intense heat to the roof and walls of the hearth. Even so, it is advisable with a new furnace to keep it working a few weeks on the less exacting grades of steel, such as tires and bar steel, in order to harden it before turning it over on the higher grades, as not even the best quality of silica brick will stand at the beginning the high temperature required for these. Toward the end of its life, the furnace, as a general rule, has again to be put back on lower grades of steel, as on account of impaired condition of checkers and draught it is no longer sharp enough for making high grade steel.

No water-cooled devices of any kind are used in the walls, roof or ports of the furnace, as it has been found as a result of many trials that even when used to a very limited extent, their cooling effect interferes with the sharp working of the furnace. The only water-cooled parts used are the charging doors, as they are far enough removed from the interior not to have a noticeable effect on the heat.

It may be of interest to give here a comparison between the life of acid and basic open-hearth furnaces, when melting with producer gas as well as with fuel oil, as measured by the average number of months from the time of charging the first heat after a general repair, until the time of tapping the last heat before

the next general repair. The average number of months is given, rather than the average number of heats, on account of the great variety of heats made, some requiring twice as long a time as others, and is based on our records for the last five years.

Average Life of Open-Hearth Furnaces

	Months
Basic furnaces on producer gas.....	9.1
Basic furnaces on fuel oil.....	10.7
Acid furnaces on producer gas.....	11.2
Acid furnaces on fuel oil.....	12.6

Oil and Producer Gas Compared

Not much time needs to be taken for the comparison between the two kinds of fuel, producer gas and oil, available for melting. Just as good steel can be made with one as with the other. Oil is more oxidizing than gas and, therefore, requires a greater proportion of pig iron in the first charge and a higher temperature after the heat is melted to settle up to the metal. On the other hand, oil cuts down the repair cost, requires fewer men per furnace, increasing the production, permits better control of temperature and extends that part of the life of the furnace which is available for making high grade steel, almost to the very end, as the direction of its flame is controlled from the outside and it is less affected by the condition of checkers and draught for generating a high temperature. Taking it all in all, oil is, therefore, much to be preferred as long as its price is not prohibitive.

Analysis of Acid Open-Hearth Process

Before going into the details of an analytical description of a heat of high grade acid open-hearth steel, permit me to state the salient points of the heat in review, M.K. 13-126, as shown by its "Melting Order." The heat was made for steam turbine bucket wheels which require tangential strength and, therefore, their acceptance depends on physical properties as shown by tangential test bars. Hence, high grade acid open-hearth steel is used for their manufacture.

It is a simple heat of plain carbon steel and its treatment is typical of the class of steel to which it belongs. Though not especially selected for this analysis, it may be considered a good, clean heat, without unnecessary complications, and is, therefore, suitable to illustrate the principles followed in the treatment of the highest grade of steel.

The initial charge of 141,000 lb., melted in a 50-ton acid furnace of the design outlined, consisted of 35 per cent of pig iron and 65 per cent of scrap. The estimated carbon, manganese and silicon in the charge were carbon, 1.72 per cent; manganese, 1.74 per cent and silicon, 0.64 per cent. Time consumed for heat in furnace follows:

	Hr.	Min.
Time of charging (in two periods).....	1	45
Time of melting.....	5	50
Time in furnace after melting.....	7	10
Total time in furnace.....	14	45

The history of the heat, after the initial charge was melted, may be thus summarized:

1 hr. 0 min. after melted—addition of 400 lb. limestone
2 hr. 0 min. after melted—addition of 1000 lb. iron ore
4 hr. 50 min. after melted—bath thoroughly revelled
6 hr. 10 min. after melted—oil and air shut off
6 hr. 50 min. after melted—addition of 1015 lb. ferromanganese
7 hr. 10 min. after melted—heat tapped
8 hr. 0 min. after melted—heat poured off

The analysis of the go-ahead test, taken 1 hr. 10 min. before tapping, and the carbon, manganese and silicon obtained from 1015 lb. of ferromanganese added 20 min. before tapping, are shown in the following table:

	C, Per Cent	Mn, Per Cent	Si, Per Cent
Analysis of go-ahead test.....	0.49	0.27	0.24
(Judged by fracture)			
Addition of ferromanganese.....	0.05	0.57	0.01
Total	0.54	0.84	0.25

The table below shows the chemical composition of the heat as aimed at and as obtained:

Composition	C, Per Cent	Mn, Per Cent	Ph, Per Cent	S, Per Cent	Si, Per Cent
Aimed at.....	0.50	0.65	0.050	0.050	0.25
Obtained	0.49	0.68	0.036	0.038	0.27

On account of the high percentage of manganese in the initial charge the slag remained greenish yellow from the time the heat was melted until it was tapped, with only slight variations in shade. The steel was poured into 23-in octagon molds, 9 ingots of 10,500 lb. and 3 ingots of 11,400 lb. The ingots, after cooling, were sent to the machine shop to be sliced into blocks, and these blocks were then forged under a steam hammer into bucket wheels for steam turbines.

To facilitate the analytical description of this heat, a graphical analysis chart has been made, showing its chemistry from the time it was melted at 2.50 a. m. until it was tapped at 10 a. m. Eight breaking tests were taken at various times and poured into a standard test mold, about 2 in. deep by 2 in. wide by 6 in. long. These tests were broken and each fracture photographed, as shown. At the same time other tests were taken, both of steel and slag, for chemical analysis. The steel tests were analyzed for carbon, manganese and silicon, and by plotting these determinations on the analysis of steel chart, curves were obtained showing the changes in these elements. The slag tests were analyzed for silica; manganese oxide, MnO; iron oxide, FeO, and Fe₂O₃; lime, CaO; magnesia, MgO; oxide of chromium, Cr₂O₃; and alumina, Al₂O₃, but, to avoid confusion, only the three most important of these oxides, SiO₂, MnO and FeO, were plotted on the slag chart, to show the changes taking place in the composition of the slag during the progress of the heat. The full analysis of each slag test is given in the following table:

Analysis of Slags from Heat M.K. 13 = 126

Test	SiO ₂ Per Cent	MnO Per Cent	FeO Per Cent	Fe ₂ O ₃ * Per Cent	CaO Per Cent	Cr ₂ O ₃ Per Cent	Al ₂ O ₃ Per Cent	MgO Per Cent	MnO FeO Fe ₂ O ₃ Per Per Per Cent Cent Cent	Total Per Cent
1....	55.0	28.0	11.1	1.4	2.6	0.3	1.4	0.6	43.1	100.4
2....	57.0	25.0	10.3	0.6	3.9	0.3	1.4	0.6	39.8	99.1
3....	58.7	22.7	11.0	0.7	3.9	0.2	1.9	0.8	37.9	99.9
4....	60.7	21.3	10.5	0.9	3.3	0.2	1.5	0.8	36.0	99.3
5....	62.2	18.7	12.7	1.0	2.5	0.2	1.5	0.7	34.9	99.5
6....	63.0	16.5	13.9	0.9	2.5	0.2	1.5	0.5	33.8	99.0
7....	58.5	18.0	15.5	2.1	2.4	0.2	1.6	0.6	38.0	98.9
8....	58.4	18.8	15.0	0.4	2.4	0.2	1.5	0.5	36.6	97.2

*Any metallic Fe present was determined as FeO. This would result in a high figure for FeO, and a low figure for Fe₂O₃.

Commencing with test No. 1, taken at 3.05 a. m., or 15 min. after the heat was melted, its analysis shows the oxidation of carbon, manganese and silicon during the time of melting by comparing it with the estimated percentage of these three elements in the initial charge. Carbon has dropped from 1.72 to 1.17 per cent, manganese from 1.74 to 0.21 per cent, and silicon from 0.64 to 0.07 per cent. A considerable percentage of manganese in the first charge is highly desirable, because by its oxidation during the melting it gives a clean slag, greenish yellow in color, almost from the start, and if the pig iron does not contain enough manganese this deficit is made up for high grade steel by the addition of ferromanganese to the initial charge. A high percentage of both manganese and silicon is also desirable in the initial charge on account of their oxidation being an exothermic reaction, facilitating the melting and giving a bath hotter and less sluggish with iron oxide by the time the charge is melted. Both these elements oxidizing at a lower temperature than carbon, their oxidation, as far as it goes, is practically complete by the time the charge is melted while the carbon is still comparatively high.

Care is now necessary in the addition of iron ore for decarburizing the metal, as this is an endothermic reaction, absorbing heat and requiring a high degree of temperature for a vigorous reaction between the oxygen of the ore and the carbon of the steel. If the addition of ore is made too soon, or in too large a quantity, its chilling effect may so retard this reaction that when finally the high temperature required is reached, and the bath goes into a boil, this will carry the decarburization so far that by the time the bath is well settled up, the carbon in the steel is well below the carbon aimed at. This would necessitate additions of spiegeleisen and pig iron in order to recarburize the heat. Such a condition is almost fatal to the production of high grade steel, because the lower the

carbon in the go-ahead test, as compared with the carbon aimed at, and, therefore, the greater the addition of recarburizing finals, the greater will be the amount of silicate of manganese produced. This may quite likely lead later on to the condemnation of the forgings made from such a heat on account of sand-splits or slag-enclosures, or on account of transverse test bars failing in extension and contraction, due to streaks of greenish slag or woody structure, caused by these streaks, or in the case of projectiles, on account of cracks starting from small slag enclosures during the hardening process, or on account of the projectiles, selected for the firing test, breaking up in striking the face-hardened armour on account of the weakening effect of these concealed impurities.

The Use of Lime

Hence the reason for the note on the melting order: Add no ore until two hours after melted. Except steadily increasing the temperature of the heat during these two hours, the only thing done was the addition of 400 lb. of limestone one hour after the charge was melted. By displacing a certain amount of iron oxide in the slag and making it more fluid, the limestone seems to put it in a better condition for subsequent reactions, at least where there is a low manganese content in the initial charge.

This, however, is in my opinion the only time when addition of lime is of any value. If done later during the de-oxidizing period of the heat, it will simply undo all the good that has been done because in replacing the FeO in the slag then, it will drive this into the steel to oxidize the silicon and manganese and make the bath again raw and unsettled. At the end of these first two hours, test No. 2 was taken. This shows the oxidation of carbon, slow at first on account of lack in temperature, now well under way. There having been as yet no addition of iron ore, this oxidation is caused by the rust in the initial charge, by oxidation of the charge in melting and by the oxidizing effect of the flame itself. The higher temperature of the slag is also shown by its slightly higher percentage of silica.

Test No. 3 taken 40 min. after No. 2, shows the oxidation still going at the same rate, due to the addition of 1000 lb. of iron ore during the interval. The only effect of this addition on the slag is a slight increase in FeO, the SiO₂ continuing to rise and the MnO slowly decreasing by dilution with the SiO₂, taken up by the slag from the bottom along the slag line.

Test No. 4, taken one hour and seven minutes after No. 3, shows the oxidizing period at an end. The silica in the slag has now gone up from 55 per cent, 15 min. after the heat was melted, to 60.7 per cent, while the two chief bases, MnO and FeO, have dropped from a total of 39.1 per cent to 31.8 per cent, in spite of the lower carbon in the steel. But most marked and showing that the de-oxidizing period has set in is the increased percentage of silicon in the steel, caused by the reaction between the carbon of the steel and the silica of the slag, according to the formula: $2C + SiO_2 = Si + 2CO$. Whereas during the melting of the charge on account of the low temperature then prevailing, the oxidation of silicon was going on at a much greater rate than the oxidation of the carbon; with the steadily increasing temperature this oxidation of silicon was first checked, then held, until finally a complete reversal has taken place, the very high temperature now reached having so increased the affinity of carbon for oxygen that it is able to reduce silicon out of silica, leaving the silicon free, in its nascent and therefore most efficient state, to de-oxidize the steel, as shown by the increasing solidity and freedom from blow holes of subsequent tests. This reaction is the essential point, that accounts for the difference between acid and basic steel, and that makes acid steel superior to basic.

What has just been said in regard to the effect of the increased temperature on the relative affinity of carbon and silicon for oxygen, is also shown to have taken place in the relative affinity of carbon and manganese for oxygen, the carbon now reducing manganese out of the MnO of the slag, the nascent manganese also assisting in the de-oxidation of the steel. This manganese reaction, however, which also may take place in

a basic open-hearth heat, is much less effective than silicon in de-oxidizing the steel, because the de-oxidizing effect of manganese is much less than that of silicon, the latter according to Brinell, being 5.2 times more effective than the former.

Test No. 5 shows the characteristic "worm holes" well developed from the increased absorption of silicon, which has gone up to 0.23 per cent. The only thing done with the heat between tests No. 4 and 5 was to give the bath a thorough raveling with steel bars to facilitate the liberation of gas. Nothing else is now being done except to keep on pushing the temperature higher and higher and thus promote the reaction between carbon and silica.

The reason why the carbon curve is still on a downward slope, in spite of the now well settled up condition of the bath, is no longer the reaction between the iron oxide of the slag and the carbon of the steel, which occurred during the oxidizing period of the heat, but the reactions of the de-oxidizing period between the carbon in the steel and the silica and the MnO of the slag, the silica and manganese as previously explained, being constantly reduced to act as carriers in de-oxidizing the steel, while the CO, resulting from this reaction bubbles slowly up through the slag. Assuming that when No. 5 test was taken the percentage of silica and manganese in the steel were the same as when No. 3 test was taken it may be shown by a simple calculation, that the carbon then would have been about 0.67 per cent instead of having dropped to 0.540, so that but for this later reaction of the de-oxidizing period, the carbon line would have been almost horizontal.

Test No. 6 shows the de-oxidizing process almost complete, the worm holes of the previous test having been nearly obliterated by the steadily increasing percentage of silicon. The heat would now have been ready for the final addition of ferromanganese made just before tapping, except for the fact that the carbon according to the first go-ahead test, was still a little too high, or 0.53 per cent. A second go-ahead test had therefore been taken out 10 min. ahead of test No. 6, and on this being reported as being down to 0.49 per cent carbon the ferromanganese was added at 9.40 a. m., and the heat tapped at 10 a. m., or 20 min. later.

Test No. 7, taken just before adding the ferromanganese, is very little different in appearance from Test No. 6, while test No. 8, taken after the addition of ferromanganese, and just before tapping the heat, is absolutely solid. The silicon in this test was 0.30 per cent, while the silicon in the heat-test, taken while pouring the steel into the molds, was 0.27 per cent, which shows that the silicon in the steel while still in the furnace, is higher in the stratum close to the slag, from which test No. 8 was taken and where the reduction of silicon from the slag is taking place, than the average silicon of the whole mass of steel.

Aluminum and titanium are never used for de-oxidizing steel in which transverse strength as determined by transverse tests, is required, because the oxides of these elements have a very baneful effect on the physical properties of such tests, even when used very sparingly. It is difficult to believe, but it is nevertheless a fact, that this effect of aluminum, added into the ladle at the rate of one pound of aluminum to 10,000

lb. of steel, and held 25 min. before pouring, very likely will cause the condemnation on account of failing test bars of a gun forging made from this steel.

Shutting Off Oil and Air

There is one more point in regard to the chemistry of this heat that requires an explanation. That is the shutting off of the oil and air, which also implies the lowering of the stack-damper, one hour before tapping. It may be noticed on the chart, that this had no effect on the carbon, manganese and silicon curves. On the chart, however, the result was a sudden drop in the silica curve, and a corresponding but less marked, rise in the MnO and FeO curves. This of course does not mean a loss of silica as far as the actual weight of this oxide in the slag is concerned. What has occurred is an absorption by the slag of an additional amount of the two basic oxides, MnO and FeO, from some source, thus making the slag less acid than it was before. The thermal effect was a very decided cooling of the slag while, on account of slag being a poor heat-conductor, the temperature of the steel underneath the slag was by comparison only slightly lowered.

The reasoning which first led me to try this treatment with the point in view of still further de-oxidizing the steel, was this: As the temperature of an acid heat rises, by degrees de-oxidizing the bath through the reactions between the slag and the steel made possible by this rise in temperature, a point is finally reached where this reaction has to be stopped, in order not to get the steel too high in silicon. If at that point the furnace were suddenly cooled by shutting off the flame, the effect would be a sudden cooling of the slag, while the temperature of steel, protected from radiation of heat by the blanket of slag, would be only slightly affected. This thermal change would have the effect on the slag of considerably increasing its affinity for basic oxides. The only supply of these oxides then available would be the traces still retained by the steel, which would therefore to a greater or less degree be absorbed by the slag. On account of the weight of slag in a heat being only about 7 per cent, while the steel makes up about 93 per cent or 13 times the weight of slag, a trace of oxides in the steel if absorbed by the slag would be quite a noticeable amount.

This, I believe is the explanation of the change in the composition of the slag, resulting from shutting off oil and air for one hour before tapping. This treatment was first tried more than 17 years ago, since which time it has been in continuous use, especially in the case of carbon and nickel steel for large ingots. The cooling effect on the steel, although slight compared with that on the slag, is also advantageous in order to lower the temperature for pouring large ingots, as otherwise the high temperature of the steel would make the ingots pull badly in forging. For this reason the steel is still further cooled by holding it from 20 to 30 min. in the ladle before starting to pour.

This ends the difference in the treatment of acid from that of basic open-hearth steel. I only want to add, that though this treatment is simple enough, it requires great skill and good judgment on part of the men in the shop, and that uniformly good results can be obtained only by careful and intelligent men after many years of training.

Pipeless Rolled Products from Annular Blooms

Proposed Method of Making Better Rails from Individual Ingots—Adaptability for Forgings and Other Products

—BY C. A. WITTER*

IN this paper I describe in general a new method of rolling lineal products such as rails, blooms, billets and bars, by which process it is possible, in a practical way, to produce products free from piping and segregation, which means that the longitudinal axis of the ingot is entirely eliminated from any point in the cross

section of the finished material, and at the same time increasing the yield from the ingot 15 to 20 per cent over the present accepted methods, and producing a more homogeneous product with an inherent physical structure superior to that now obtained.

The process is a combination of existing proven practices involving the addition of only one new and

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novel operation, which is purely mechanical and has been developed as it would apply to large tonnage products, such as rails blooms, etc. This brief description of the process is confined to the manufacture of rails in particular, as being the solution of a serious problem which to-day confronts the rail manufacturer and railroads alike.

If we are to be guided by an interpretation of the revisions which have been applied to rail specifications over a period of years, the principal chemical weakness of rails as at present manufactured is due to the fact that the axis of the finished rail coincides with the longitudinal axis of the ingot, wherein are contained all the defects, such as piping, segregation, etc. The grad-

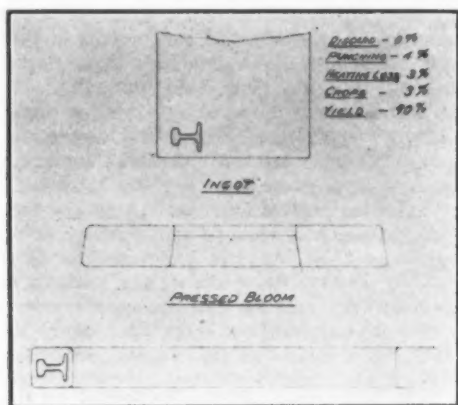


Fig. 1.—The Progressive Steps Involved in the Manufacture of Pipeless Rails from Individual Ingots

ual increase specified in discard alone apparently has not fully overcome the trouble arising from this source.

As the ingot in most practices is never allowed to become cold, it is liable to be bled when going through the cogging rolls. This naturally destroys the physical structure of the center or vital part of the ingot, which is scrapped. Even though the ingot does not bleed, it does not signify that the structure is solid throughout its entire length, as the cogging operation can be nursed to a point that will not bleed the ingot, but there is

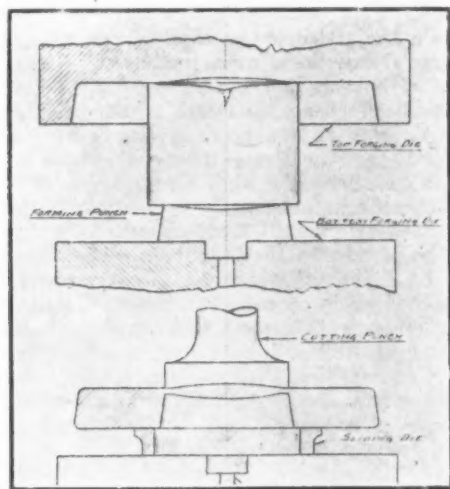


Fig. 2.—The Method Used in Forming the Bloom Under a 10,000-ton Press

still no proof to signify that the structure of the center of the ingot is not destroyed.

The structure of the ingots in the various progressive stages of manufacture when going direct from the open-hearth to the soaking pit and cogging mill without permitting a permanent setting of the original ingot is only a theoretical conjecture, and may account for some of the present defects. While it is conceded that the piping itself can be largely eliminated with sufficient discard from the ingot, to further insure the elimination of the segregation would require a still greater discard, making it commercially prohibitive.

It was the idea of eliminating the center or longitudinal axis of the ingot from the cross section of the finished product that suggested this process.

Fig. 1 shows an ingot as it would be used in the new process, which is similar to that which has been so successfully used in the past ten years for rolled steel wheels, tires, and other annular products. It shows the progressive steps in making pipeless rails by the new method.

The manufacture of this type of ingot is described in detail in a paper by Lawford H. Fry of the Standard Steel Works Co. and presented to this Institute at the meeting in November, 1919, under the title of "The Manufacture of Ingots for Tires and Rolled Wheels." [Abstracted in THE IRON AGE, May 27, 1920.]

After the ingot has been poured, it would be allowed to cool, then reheated thoroughly in a continuous furnace; the reheating accounts for the 3 per cent loss; or, the hot ingots could be used as at present; but to insure freedom from the oxidized top of the ingot appearing in any point of the rail, I would use a punch of larger diameter than the diameter of the ingot. This would slightly increase the percentage of loss in the punching, which would be offset, however, by the reduction in the heating loss to about 1½ per cent.

The ingot is then placed under a 10,000-ton hydraulic press and bloomed to the desired width. A hole is

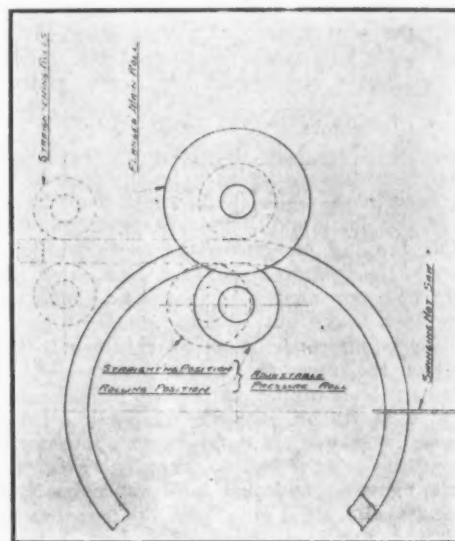


Fig. 3.—One Method of Splitting and Straightening the Circular Bloom on the Mill Immediately After Rolling to Size

punched in the bloom in the same operation, removing piping and segregation, and to the required size to permit the bloom being placed over the pressure roll of the blooming mill, which is of the same general type as used in rolling tires. The bloom is then rolled to the necessary diameter, to give the required thickness of bloom.

The new operation referred to consists in the cutting and straightening of the circular bloom. Two methods of performing this operation are described in detail later. The straightened bloom then goes direct to the finishing mill to produce the finished product.

I have shown the rolled bloom of square section. This naturally brings up the question of crops due to the variation in length of developed surface between the inside and outside diameters. This is overcome by using a bloom, the inner half section of which has sufficiently greater area, so that when the cross section of the bloom is reduced to a square in the finishing mill, all surface measurements will be approximately the same.

The time cycle required for the forging, rolling and straightening operations would not be any more than is required on modern rail mills for producing the final size of bloom before going through the first shaping pass. By this process, there is accomplished in two operations what ordinarily requires the first eight to ten passes on a modern blooming mill, thereby making

it practical to complete the forging and rolling operations in one heat, as is done at present.

The process, however, applies with equal advantage to the special requirements of the automotive industry for alloy steels of the highest grade as used for crankshafts, connecting rods, etc., also to tool steel as well as shell and other ordnance steel requirements.

The advantages of the process described are:

Quality, which is accomplished by the elimination of piping and segregation, insuring a homogeneous product both chemically and physically.

An increased yield from the ingot. On the basis of 70 per cent yield in accordance with the accepted practice of to-day, 1430 tons of ingots produce 1000 tons of rails. By the use of the method described, 1430 tons of ingots would yield at least 1200 tons of rails, an increase of 200 tons.

Better physical structure. A better physical structure is assured as the ingot receives work in both directions.

Fig. 2 shows the method used in forming the bloom under 10,000-ton press. Both the bottom punch and the top die are cupped, which prevents the piping or segregation from spreading during the forging operation, and confines it in a double convex disc form, as shown in the lower sketch, which shows the bloom with the cutting punch in position ready to remove the burr or punching. With this method of producing the bloom, the ingot is centered directly on top of the bottom punch, over which the ingot is forced down to the required width.

The press is equipped with a bottom push-up cylinder, which has a ram that extends through the center of the platen. This, after the bloom has been forged, is raised, which allows the sliding die to be placed under the bloom and gives it the necessary support while the cutting punch broaches the burr or punching. This, you will note, eliminates the necessity of turning the bloom and punching from both sides.

Fig. 3 shows one method of splitting and straightening the circular bloom on the mill immediately after rolling to size. The cutting is done with an adjustable swinging hot saw accommodating any diameter of bloom, depending on whether the ingots were poured for single or multiple lengths. After the bloom has been sawed, the pressure roll would be advanced ahead of center to guide the bloom through a pair of straightening rolls, from which it would pass direct to the finishing mill.

Another method of straightening the circular bloom would be a machine independent of the blooming mill, making it a separate operation, and would be the means of eliminating two operations in the circular blooming mill, thereby materially increasing the capacity. This could be either a motor driven or a hydraulic machine, and could be designed to operate either vertically or horizontally, the latter being preferable.

The circular bloom would be hot sawed on the blooming mill, as this operation would be possible while the pressure roll was being drawn back in position to remove the finished bloom from the box pass in the main roll, thereby no time being lost during the rolling operation. The blooms would then be transferred on a roller table direct to finishing mill.

To further substantiate the claims which have been made, chemical and physical tests were made by the

Lackawanna Steel Co., Buffalo, from the experimental rails which were rolled at their plant on April 1, 1920. These rails were rolled from two 12 in. x 12 in. x 5 ft. 8 in. blooms, each bloom being made by the process described, for each of which was used a 23-in. diameter octagonal acid open-hearth ingot of the following analysis:

	Per Cent
Carbon	0.70
Silicon	0.20
Phosphorus	0.042
Manganese	0.56
Sulphur	0.039

The report which follows was submitted by the metallurgical department to the officials of the Lackawanna Steel Co., with whose permission this is submitted:

Rolling: These two blooms were approximately 12 in. x 12 in. x 5 ft. 8 in. They were charged in Pit 28, No. 1 rail mill, at 11.35 a.m., April 1, 1920. The first bloom was rolled at 7.07 to 7.15; and the second at 7.16 to 7.23 p.m. into section 1000 A. S. C. E. Two rails were obtained from the first bloom, each 30 ft. long, and stamped 00012-A and 00012-B; also two rails from the second bloom, the first, stamped 00013-A, was 30 ft. long, and the second, stamped 00013-B, was 33 ft. long.

Drop Tests: Standard drop tests were made with an 18 ft. drop on a piece cut from the top of each bloom at the hot saw. The results were as follows:

Rail	Position	Blow	Deflection,	Ductility	Total
			In.		
00012	Head up	1	1.26	03.03.04.05.05.04	0.24
		2	2.18	06.07.08.08.07.06	0.42
		3	3.10	11.12.13.12.08.07	0.63
		4	3.92	14.16.17.15.11.08	0.81
		5	4.88	16.17.18.17.13.12	0.93
		6	Broke	17.18.18.17.13.12	0.95
00013	Base up	1	1.38	05.05.05.04.03.03	0.25
		2	2.36	07.08.11.11.03.08	0.53
		3	Broke	08.11.12.13.13.08	0.65

Analyses: Drillings from pieces of rail from the middle of each bloom gave results as follows, the drillings being from the upper corner of the head, and the junction of the head and web:

Rail	Position	C, Per Cent	Mn. Per Cent	P, Per Cent	S, Per Cent	Si, Per Cent	Cu, Per Cent
00012	1	0.670	0.55	0.051	0.040		
	2	0.705	0.54	0.052	0.041	0.206	0.22
00013	1	0.670	0.55	0.050	0.034		
	2	0.670	0.52	0.051	0.036	0.198	0.20

Tensile tests from these same operations gave results as follows:

Rail	Position	Elastic Limit, Lb. Per Sq. In.	Ultimate Stress, Lb. Per Sq. In.	Elongation, Per Cent in 2 In.	Reduction of Area, Per Cent
00012	1	96,400	134,400	11.0	20.6
	2	81,920	128,400	13.0	17.0
00013	1	73,420	125,400	12.0	20.6
	2	89,410	128,400	12.0	20.6

The blooms when straightened were not marked to show which surface of the rail came from the outside of the ingot. This neglect in itself has been the foundation for the most interesting development to date in that it has been impossible to show or trace, by numerous check analyses, from which surface of the bloom the head of rails was formed. The blooms also were not put through the de-seaming machine used in the standard rail practice at Lackawanna.

Fatigue of Metals Under Repeated Stress*

Treatments Affecting Fatigue Strength—Importance of Localized Stress—Scope of Present Investigation—Testing Machines

— BY H. F. MOORE AND J. B. KOMMERS —

THE failure of machine parts under repeated stress has come to be commonly spoken of as due to fatigue of the material. The cause of such failure used to be thought to be the crystallization of

*Report of progress in an investigation under the joint auspices of the National Research Council, Engineering Foundation and Illinois Engineering Experiment Station. The authors are respectively research professor and research associate professor of engineering material, University of Illinois, Urbana, Ill.

metal, but, as will be noted later, the phenomenon is one of a breaking up of crystals rather than of their formation. The accompanying table gives some idea of the number of repetitions of stress in the normal lifetime of various structural and machine members:

A fatigue failure is characterized by the complete absence of elongation or reduction of area at the break. The fracture is sudden and is similar to that which is ordinarily expected only from brittle materials. A

rotating beam will crack at right angles to the length of the beam, which is also at right angles to the direction of stress.

Metals while being subjected to fatigue have been observed under the microscope, and it has been found that the crystals of which a metal is composed will allow deformation to occur by movement along certain gliding planes within the crystal. This gliding or slipping is indicated by the appearance of lines running across the crystals, as shown in Fig. 1. These lines are called slip lines, or slip bands.

In general, fatigue failure follows a path through the crystal grains themselves rather than along their boundaries, and this is true even though in going from one crystal to another the plane of failure must change its direction, because of the different orientation of the crystals. The primary cause, therefore, of fatigue failure is localized deformation. This deformation in any particular crystal is very small in amount and apparently even very accurate and sensitive extensometers cannot detect the deterioration which is going on.

Because steel is made up of many minute crystals, the structure is not likely to be homogeneous. Fur-

of the stress-deformation curve does not coincide with the original path, but lies slightly lower, the deformation seeming to lag behind the stress, so that when the stress is zero the deformation of the specimen is not yet back at zero. If now the specimen is loaded in compression, and the load reduced to zero, it is found that a loop has been formed by the stress deformation curve. This loop is called a mechanical hysteresis loop, from analogy with magnetic hysteresis.

The area of this loop represents energy which has been absorbed by the specimen, but which has not been given back again. In each cycle of stress, therefore, there is a small amount of work done because of the inelastic action of the material.

Testing Machines

In determining the resistance of metals to fatigue, Wöhler used machines which subjected the specimens to direct tension and compression, to repeated bending on a stationary beam, to reversed bending on a rotating cantilever beam, to repeated torsion, and to reversed torsion. In the direct stress, repeated bending, and in the torsion test, Wöhler used machines in which calibrated springs were employed to measure the load applied to the specimen. This general type of machine is quite common and is illustrated in Fig. 2. The rotating beam type, either cantilever or simple beam, has probably been more extensively used than any other machine. This type is illustrated in Fig. 3.

Wöhler's machines applied the stresses at rates less than 100 per min., so that many weeks of testing were required to stress a specimen as many as 10,000,000 times. In later types of machines attempts have been made to increase the speed of the machines, and speeds up to 2000 r.p.m. have been used successfully. A machine of this kind running 24 hr. per day will give results fairly rapidly.

Various other types of testing machines have been employed by experimenters. In some the stress is produced in the specimen by the acceleration effects of reciprocating masses, in others the pull is applied by an electromagnet, and in still others the reversed bending which is produced occurs in only one plane.

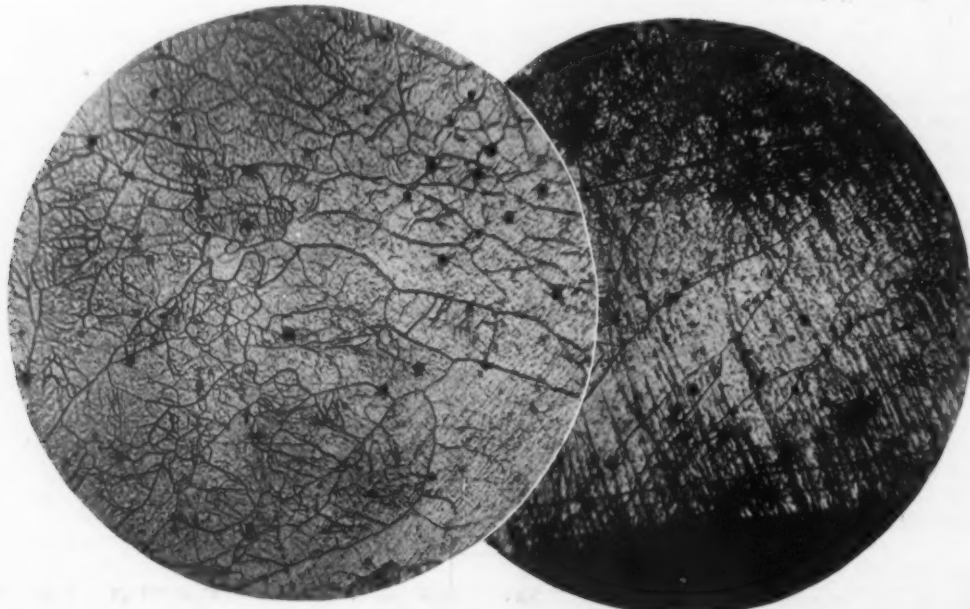
Machines for producing reversed bending on a cantilever beam have been used by Arnold and others. These machines stress the materials beyond their yield points so as to produce failure after only a few hundreds or thousands of cycles of stress. In such a test the stress to which a specimen is subjected is not known, and it is therefore difficult to interpret the results of the test. Thus far it has not been shown what relation exists between this short-time test and the test which stresses materials only within their elastic limits.

In the ordinary fatigue test the machine is set to

Part of structure or machine	Approximate number of repetitions of stress in the "lifetime" of the structure or machine
Railroad bridge, chord members.....	2,000,000
Elevated-railroad structure, floor beams....	40,000,000
Railroad rail, locomotive wheel loads.....	500,000
Railroad rail, car wheel loads.....	15,000,000
Airplane-engine crankshaft	18,000,000
Car axles	50,000,000
Automobile-engine crankshaft	120,000,000
Lineshafting in shops.....	350,000,000
Steam engine, piston rods, connecting rods and crankshafts	1,000,000,000
Steam-turbine shafts, bending stresses.....	15,000,000,000
Steam-turbine blades	250,000,000,000

thermore, there are likely to be many microscopic flaws throughout the material. Somewhere, due either to non-homogeneity or to flaws, there will be high local stresses, and at such places the material will be most likely to deteriorate by the repeated action of fatigue stresses. The presence of internal stresses, due to previous heat treatment or mechanical treatment, would also tend to weaken the material when fatigue stresses of a similar kind are applied later.

Tests conducted with apparatus of extreme sensitivity have shown that the action of materials within the ordinary elastic limit is not perfectly elastic. For instance, when a specimen is first loaded in tension, and then the load is reduced to zero, the return path



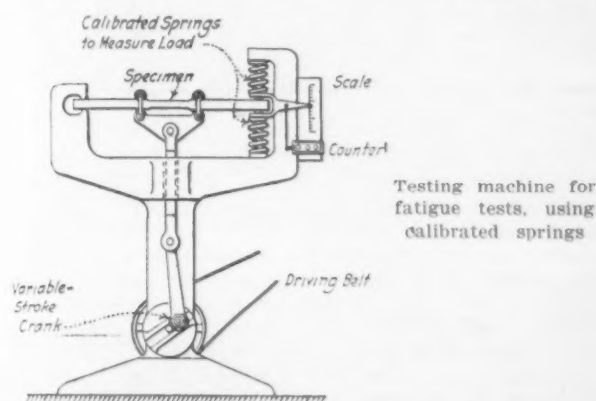
Development of Slip Bands by Repeated Stress, One (Left) a Photomicrograph of Iron Before Being Stressed and the Other a Photomicrograph of Iron After Several Hundred Repetitions of Heavy Stress

produce a certain stress in the specimen, and the test is continued until failure occurs, the number of cycles of stress before failure being recorded by a suitable counter.

The S-N Curve

When specimens of a given steel are subjected to a series of stresses the results may be conveniently plotted as a curve having the unit stress S , as ordinates, and the number of cycles for rupture N , as abscissae. This curve may be plotted as shown in Fig. 4 (a); or by plotting the logarithms of S and N curves such as shown in Fig. 4 (b) are obtained.

In discussions of fatigue tests the term "endurance limit" has been employed. By this is meant the unit stress at which the S-N curves as in Fig. 4 (a) seem to become horizontal, and therefore, presumably, the unit stress which the material could endure indefinitely. It has often been assumed that the unit stress corresponding to 1,000,000 cycles is too high to be considered as an endurance limit, and that failures may be obtained at lower stresses if the tests are continued a sufficient length of time. This matter is related to another doubtful point in connection with the curves

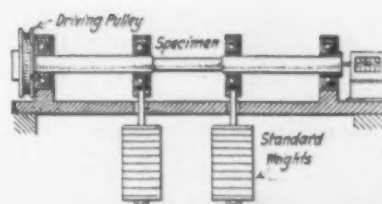


of Fig. 4 (b). The doubt arises because it is not known whether the logarithmic curves continue as straight lines for large values of N . It is of the greatest importance to know the nature of the S-N curve for large values of N , and this would probably be determined with sufficient exactness if tests were continued up to 100,000,000 cycles. If there is an endurance limit such tests will probably determine it with a sufficient degree of accuracy.

It is evident from Fig. 4 (b) that any formula for fatigue stress which is based on the assumption that the S-N curve is a straight line on logarithmic paper will give results on the side of safety, because for increasing values of N the corresponding values of S become smaller and smaller.

Criteria for Fatigue Strength

Attempts have been made to show that a relation exists between the endurance limit and the elastic limit as determined from a static tensile test. These attempts have not been satisfactory, and this is to be expected, since the endurance limit which was used was itself indefinite. Furthermore, the elastic limit is also an indefinite quantity, and depends to a considerable extent upon the sensitiveness and accuracy



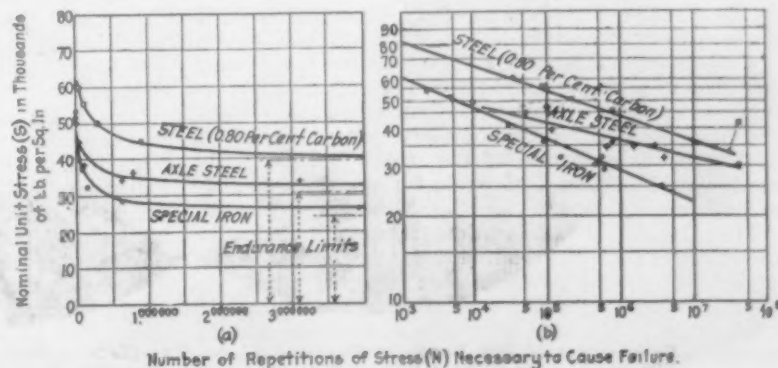
Rotating Beam Type of Repeated Stress Testing Machine: Diagram and photograph of machine used in present joint investigation of fatigue of metals



of the instruments employed in determining it and upon the accuracy used in plotting the results. It has been shown that a material having a higher elastic limit than another one is not necessarily better in withstanding repeated stresses.

The proposal has been made to compare the fatigue properties by means of the number of cycles of stress that is withstood for a constant standard stress. Also it has been proposed to determine the fatigue strength by determining the stress which causes failure for a standard value of N . These methods would determine only one point on the S-N curve, and since these curves sometimes cross each other, the information would not be reliable unless tests were carried out to a very large value of N . To compare fatigue properties by determining the S-N curves up to N equals 1,000,000 cycles, is likely to be misleading for the same reason as mentioned in the preceding paragraph.

Diagram of results of fatigue tests (S-N diagram): (a) diagram with ordinary co-ordinates, (b) diagram with logarithmic co-ordinates



There is at present no short-time test which has been proved to be a reliable criterion of fatigue strength. If such a test could be developed it would of course be of the greatest commercial importance.

Treatments Affecting Fatigue Strength

The effect of various heat treatments on fatigue strength has not been studied systematically, although it is known that such treatments have an important influence. Overheating which tends to make material brittle seems always greatly to decrease the fatigue strength. Such overheated material may often be restored by proper reheating. Annealing, in general, seems to reduce the fatigue strength somewhat. The results on overstrained material are somewhat contradictory, some tests seeming to indicate increased fatigue strength, and others that tensile overstrain decreases fatigue strength while compressive overstrain increases the strength. The sorbitic structure in steels seems to be most effective in resisting fatigue, while the martensitic structure is weak. Material which has been subjected to repeated stresses apparently does not have its life increased by annealing or by rest.

In normal carbon steels the fatigue strength seems to increase with increase of carbon up to about 0.9 per cent carbon. The effect of nickel, chromium, vanadium, etc., upon fatigue properties has not been studied systematically, although apparently these alloys improve the material.

Localized Stress and Its Importance

One outstanding feature of fatigue phenomena in metals is the importance of small localized stresses. Because their derivation depends on mathematical processes it is easy to come to regard the ordinary formulae for computing stresses in machine and structural parts as exact; but as a matter of fact such formulae give results representing general conditions of stress, and neglect the existence of hundreds of localized stresses affecting minute areas. For example, the ordinary method of computing stress in a plate under tension, punched for rivet holes, is to divide the load on a strip of the plate by the net width of the strip after the width of rivet holes has been deducted; this method assumes that the tension is uniformly distributed across the plate, and neglects to consider concentration of stress near the edges of the holes where the intensity of stress may be twice as high as the computed stress. Shoulders with sharp fillets, screw threads and shafts with keyways are a few of the many illustrations which might be given of members in which the application of the ordinary methods of stress computation neglect localized stresses.

So long as a member is subjected to static load, or if the load on it is repeated only a few hundred times in its life, these localized stresses do no particular harm. Under a loading repeated thousands of times this is all changed. The minute overstressed areas form centers of damage which spread in the form of microscopic cracks, and at the end of each crack there is a region of high localized stress which causes the spread of damage to continue—often to continue until the minute damaged area grows into a large damaged area, and failure follows. The growth of these microscopic cracks is shown in Fig. 1.

This spreading of structural damage in the form of microscopic cracks explains the suddenness of failure under fatigue. A flat bar of soft steel may be bent double without cracking, but if it be cut half across by a fine saw cut and then bent it snaps at the saw cut. The microscopic cracks through metal under repeated stress are equivalent to little saw cuts, which gradually join each other; they have very little effect on the general deflection of the metal, but gradually develop localized planes of weakness along which sudden failure may occur.

The phenomenon of localized stress also helps to explain why the "elastic limit" as determined by a testing machine test is not a sure index of resistance to fatigue under repeated stress. Suppose the metal to be tested is of such chemical composition and has received such heat treatment that it is, in general,

strong, but due to the method of production or treatment during fabrication it contains blowholes, snowflakes, minute cracks, or initial strains. Then if its elastic limit is determined by a gradually increasing load these minute flaws will show very little effect, because they affect only a minute portion of the part stressed by the testing machine, while the extensometer measures the stretch over a considerable volume of metal.

If the yield point is determined by the drop of the beam, the yielding at a microscopic flaw will not cause anywhere nearly enough change of load to make the beam drop.

If, however, the metal is put into service under repeated stress, each blowhole, snowflake, or crack is a potential center of high localized stress and a potential nucleus of progressively spreading damage which may result in sudden fatigue failure.

Localized stress may be external as well as internal. It may be caused by internal flaws as outlined above or at external irregularities of surface. If any structural or machine member has in its outline a sharp, inwardly projecting corner it can be shown that the stress at that corner is theoretically infinite, and that the localized stress at any fillet increases very rapidly as the radius of the fillet is reduced. Rough turned finish may easily leave a member, e. g., a car axle, with a series of grooves of small radius, at the root of which grooves occur very high localized stresses.

Outline of Investigation of Fatigue

In the fall of 1919 there was started at the University of Illinois an investigation of the fatigue of metals under the joint auspices of the National Research Council, Engineering Foundation and Illinois Engineering Experiment Station. This investigation is at present organized and financed to be carried on until the fall of 1921. In planning this investigation it was decided by the advisory committee of the National Research Council that it should be the object of the investigation to make a series of fatigue tests of seven or eight typical steels accompanied by very careful static tests, and impact tests, and in connection with these tests various special tests, including magnetic tests.

The testing machine chosen for the repeated stress tests is of the rotating beam type, and is practically the same as that described by F. M. Farmer before the American Society for Testing Materials, in June, 1919. This type gives reversals of a very definitely known bending moment, and there is a considerable portion of the specimen under constant bending moment. The specimen is a straight rod slightly reduced in section over the middle portion of its length. Fig. 3 (b) shows the testing machine and the specimen.

By past investigators there has been obtained a considerable amount of data on the fatigue failure of metals, but the committee felt that there was need for a comprehensive series of tests on metal whose history was thoroughly known, correlated with very careful static tests of the same material. It is planned for each kind of steel tested, and for each heat treatment given each kind of steel, to run not less than six tests to 100,000,000 repetitions of stress, and to obtain 18 to 24 points on a diagram of fiber stress plotted against numbers of repetitions of stress necessary to cause failure.

This series of tests, it is hoped, will serve as a reconnaissance in the field of ferrous metals, and will furnish data to give a fairly satisfactory answer to the question of relation of fatigue resisting power to the ordinary static elastic properties of material. The committee felt that until the fundamental reconnaissance was made it could not go ahead with tests of special materials. It is hoped that this preliminary series will throw enough light on this fundamental relation of the fatigue strength and static strength, and will develop methods of testing so that further investigation can be pushed much more rapidly. The test program is under way at the present time, and it is hoped that data may be secured which will be recognized to be of sufficient value to warrant the continuing of the investigation beyond the original period set.



Musical



Gardening



Clubs



Hospital



Restaurant



Sanitation



Educational



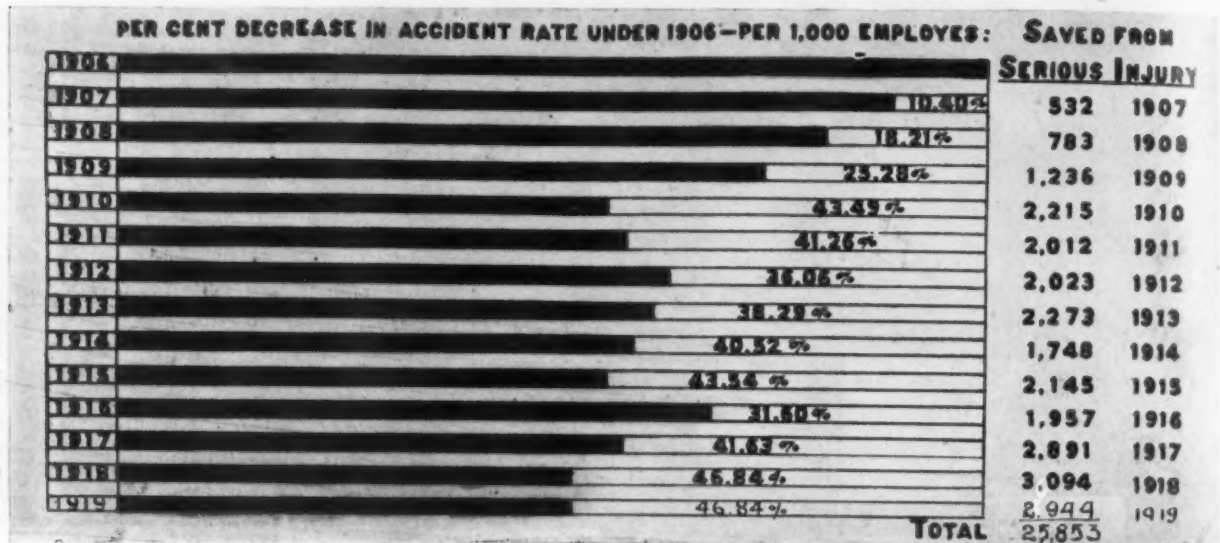
Playgrounds



Home Visitation by Nurses

TYPICAL WELFARE ACTIVITIES OF THE UNITED STATES STEEL CORPORATION

How Accidents Have Been Reduced in Corporation Plants



Welfare Work in the Steel Industry

Millions Spent by the Steel Corporation in Recent Years—Splendid Record of Accident Prevention

C. L. CLOSE, manager, Bureau of Safety, Sanitation and Welfare, United States Steel Corporation, read an elaborate paper on welfare work in the steel industry. His paper was devoted particularly to the work of the United States Steel Corporation and its subsidiary companies, but he stated that their activities are similar to those of other large companies in the iron and steel industry. He said that in the early days of the development of the iron and steel industry little attention was given to the conservation of human resources, or to the conditions in general under which employees worked and lived. Industrial pioneers were confronted by many intricate and complex problems, and so occupied were they in the development of processes and in striving to become the leaders of the world in manufacturing that the human side of steel making received little attention. But times have changed, and many activities based upon sound and broad policies have been established to protect the workers. Every endeavor is being made throughout the industry to create environments in the plant, home and community of a character which will contribute to the workman's happiness, health and comfort, to foster within him a spirit of contentment and co-operative interest in his work, and to insure him against serious injury and physical disability, which may, in any way, affect his earning power or standing as an efficient producer.

"Primarily," said Mr. Close, "this great movement in the industrial world was purely humanitarian, a manifestation of the sympathetic feeling the average person must feel toward his fellow-men, and in no direction, perhaps, has there been a more shining example of the application of the Golden Rule so dear to the heart of the honorable president of this institute."

Mr. Close said that although various attempts were made to improve conditions, there was no concerted or organized effort until after the formation of the United

States Steel Corporation, which in 1906 inaugurated activities including the appointment of a safety committee, consisting of representatives of the corporation and the larger subsidiary companies, which had already given some study to the subject of accident prevention. In March 1911, the Bureau of Safety, Sanitation and Welfare of the Corporation was organized. It carries on the administrative work of the various committees dealing with these subjects.

The good resulting from the work of the corporation's safety committee led to the appointment of safety engineers and supervisors and other safety committees. Up to the present time, 26,000 employees have served upon these committees, and there are now about 5,500 men so serving, in addition to 101 safety engineers and supervisors who devote their entire time to accident prevention work. Continuing, Mr. Close said:

"The results of the work on accident prevention have been very gratifying. The serious and fatal accidents are about one half of what they were in 1906, and it is estimated that in the time intervening we have saved 25,853 men from serious or fatal injury. The total number of disabling accidents—that is, accidents which cause a loss of time of greater duration than the remainder of the working turn—have been reduced in some instances as much as 97 per cent. To date approximately \$10,000,000 have been spent in providing safeguards and the correction of conditions which are responsible for accidents.

"Experience has taught us that fully 80 to 90 per cent of industrial accidents can be eliminated if steps are taken to organize the work properly. It has also taught us that from 70 to 80 per cent of all accidents occurring are attributable to thoughtlessness and carelessness, either on the part of the workman himself or fellow workmen. It is quite evident, therefore, that considerable attention must be given to educational

	UNITED STATES STEEL CORPORATION		
	1912	1913	1914
Welfare	\$1,068,253.02	\$1,600,242.69	\$535,056.26
Sanitation			
Accident prevention			
Relief for injured men and the families of men killed...	595,649.18	660,593.84	615,966.64
The employees' stock subscription plan (approximate)...	2,587,516.18	3,013,638.12	2,253,901.60
For pension fund payments in excess of income provided by permanent fund.....	1,000,000.00	1,000,000.00	1,000,000.00
Note—Total pension payment to employees for additional benefit payments and administration cost.....	132,479.37	159,306.94	216,954.28
For the creation of a permanent fund.....	(358,780.92)	(422,816.14)	(511,967.90)
	(56,175.52)	(43,222.42)	(35,621.85)
	500,000.00	500,000.00	500,000.00
Total.....	\$5,833,897.75	\$6,938,781.59	\$5,687,212.81

measures in which the workman is taught the fundamental principles upon which successful accident prevention is constructed, and to the inculcation of care and forethought which will overcome careless habits. Those engaged in conducting the safety activities in the Steel Corporation have been impressed with the importance of this feature of the work, and every endeavor is being made to establish hearty co-operation.

"Statistical data prepared a few years ago by the Government, based upon careful investigation, indicate that the steel mills in this country are the safest in the world. A study of the accident experience in the German steel mills, which country we all know is well advanced in the art of steel making, shows a rate of accident frequency covering fatalities, permanent and temporary disability over a period of 13 weeks, of over 17 per 1000 men employed, as against a rate of about 10 per 1000 men employed in the mills in this country. It was found that only one plant in America, among those covered by this investigation, had a frequency rate greater than that mentioned above for Germany. This is indeed an excellent showing for the American steel mills and one of which we may be justly proud, the more so in view of the fact that accident prevention is a subject which has been given considerable attention by German manufacturers."

Mr. Close referred to the work in first aid and rescue, and said that as a necessary adjunct completely equipped emergency hospitals had been provided. A base hospital recently constructed at Fairfield, Ala., by the Tennessee Coal, Iron & Railroad Co., at a cost of over \$1,000,000, provides facilities for the benefit of employees and their families and will accommodate 348 patients. Some other subjects referred to by Mr. Close were:

Sanitation, including the furnishing of pure drinking water, the expenditure for this work last year amounting to over \$3,000,000.

Plant restaurants, where wholesome food is provided at moderate cost and other benefits are enjoyed.

Clubs, including dormitories, reading room and library, gymnasium and swimming pool, baths, auditorium and dance hall, billiard and pool rooms, bowling alleys, basket ball, halls with motion pictures, lectures, concerts, smokers, etc. Good Fellowship clubs organized by employees help members who are in need.

Gardens where flowers are cultivated and vegetables are raised.

Visiting nurses who tend the sick, give instructions in personal and domestic hygiene and domestic science, help families to deal with financial, physical and marital and other domestic troubles, and conduct day nurseries.

Practical housekeeping centers, where there are classes for children in sewing, cooking and housekeeping, meetings for the instruction of women, clubs for small girls and boys and clubs or associations for women employees.

Playgrounds, which are enjoyed by thousands of little folks.

Picnics, which are attended by very large numbers, one at Duquesne, Pa., by 20,000 people.

Musical organizations, including the famous Liberty Chorus, composed of employees from two plants of one of the western subsidiary companies. This chorus appeared many times for war activities, and made a special trip at its own expense to New York to sing at meetings at the Carnegie Music Hall, on the steps of the Sub-Treasury Building, and other places.

Dental clinics, where the teeth of children are properly treated and the tooth brush drill is made the opening exercise every day in school. Service is also provided for adult employees at reduced costs.

The stock subscription plan which last year resulted in 66,311 employees subscribing for stock in the corporation.

Pensions, which are granted to retiring employees.

Education and Americanization, including vocational training and apprenticeship classes. Much of this work is done by the visiting nurses.

Housing; in the planning of towns or large dwelling communities, the following objects have been kept in mind, comfortable housing of employees, healthful surroundings, education and religious opportunities, recreation facilities, civics—to give employees the benefits and opportunities of a small city.

In conclusion, Mr. Close said:

"In consideration of the excellent spirit and the concerted action of those at the head of the steel industry in the establishment of every facility consistent with the welfare of their employees, and the success which has attended their efforts in this direction, I feel impelled to say, in conclusion, that the conditions under which the employees of our industry work and live today are superior to those in any of the basic industries in this country or throughout the world."

Charleroi, Pa., Plant to Make Alloy Steel

The newly acquired plant of the Electric Alloy Steel Co., Youngstown, Ohio, at Charleroi, Pa., is being overhauled, and it is expected will be ready for production about July 1. Offices of the company will be maintained in Youngstown. The property was purchased from the Universal Steel Co. of Charleroi. The plant was erected for Government work and financed by the Government, the controlling company paying the cost of construction. After the war ended and the work of building eagle-boats, for which the plates manufactured by the works were made, was discontinued, the company found the plant did not fit into its organization and it was abandoned.

The site consists of 13½ acres. The main building is 57 x 531 ft. Two additional buildings are 90 x 327 and 90 x 227 ft. A number of smaller buildings are on the location, including dwellings for workers.

Principal equipment comprises a six-ton electric furnace and two crucible furnaces. It will be operated continuously. Meanwhile the company will proceed with plans for a plant in Trumbull county, though construction will be postponed until more normal transportation and construction conditions are again restored.

Sharon Plant to Resume Work Soon

Severn P. Kerr, president Sharon Steel Hoop Co., Sharon, Pa., announces that orders for the Sharon plant are such that full operation will not only be resumed at the earliest possible moment, but will be continued uninterruptedly for some time to come. The company was forced to close its Sharon plant, as to its finishing departments, at the close of business on April 17 and the blooming mill department on April 26 because of interruption of railroad service as a result of the strike. The company is sufficiently supplied with raw material to permit full operations as soon as the railroad conditions will make it possible for the plants to secure adequate fuel supplies.

J. S. Coxey, Jr., secretary-treasurer Alloy Electric Steel Co., Warren, Ohio, announces that contract for erection of a plant has been awarded to the Boldt Construction Co., Cleveland, and that the work will be completed in the fall. The company plans to increase its capital from \$150,000 to \$300,000. At the start it will employ 300 men, working three shifts a day.

EXPENDITURES FOR PURPOSES LISTED BELOW

1915	1916	1917	1918	1919	Totals
\$476,384.19	\$752,114.00	\$1,652,955.42	\$3,142,899.00	\$2,523,523.44	\$11,751,428.02
953,056.58	1,402,798.49	2,406,951.68	3,145,174.89	3,208,717.92	11,732,666.20
608,644.28	848,079.63	998,806.94	1,110,064.00	1,143,534.53	6,530,706.43
1,988,751.42	2,593,960.65	3,171,994.88	3,336,459.38	3,706,015.45	22,652,237.68
1,135,000.00	1,150,000.00	1,175,000.00	1,300,000.00	1,400,000.00	9,160,000.00
335,970.89	361,938.47	339,093.52	136,644.39	142,254.70	1,824,692.56
(659,389.42)	(711,130.33)	(712,506.65)	(709,059.82)	(733,707.45)	(4,819,357.63)
(32,874.13)	(32,032.84)	(30,763.69)	(31,424.58)	(32,097.54)	(294,212.57)
500,000.00	500,000.00	500,000.00	5,000,000.00	.....	8,000,000.00
\$5,997,807.36	\$7,608,941.24	\$10,244,803.44	\$17,171,241.66	\$12,124,046.04	\$71,651,731.89

Mechanical Engineers Meet at St. Louis

Danger in Decline of Commodity Prices Pointed Out—Engineers Discuss Appraisal and Valuation Work—Symposium on Castings

“**E**VERY public spirited citizen having the welfare of the community at heart, and conversant with the evil of low wages, desires to see labor get just recognition, but outside of catastrophic disturbances which we cannot undertake to predict, a belief in lower commodity prices in the immediate future is hard to justify, unless lower wages are taken for granted,” said Cecil F. Elmes, Chicago, at the spring meeting of the American Society of Mechanical Engineers, held at Hotel Statler, St. Louis, May 24 to 27 inclusive. “We are accustomed to hear a daily prayer that the present high prices will give way speedily to lower levels, and the idea is prevalent that we will be more prosperous when such lower prices arrive. The fallacy of this hope lies in the fact that lower prices usually result from a lack of demand for commodities, and a lack of demand means a slowing up in commerce, a depression in business, and its result—a lack of employment of labor. Let any one who is clamoring for low prices refer back to such a time as the early 90’s of the last century, when commodity prices were at their lowest.”

On the other hand, the speaker stated, high prices, so long as they do not run into panic or famine prices, may be by no means an economic evil. Panic and famine prices are and should be within the control of the community and their evil effects can be largely eliminated by a wise use of that control. The writer traces the changes that have taken place in prices and wages both in this country and in England since the year 1600, and shows how these have been influenced by contemporary history. To illustrate how the price of a commodity reflects the story of its industrial development, apart from the main elements of concurrent historical events, Mr. Elmes reproduces a record of the average cost of a ton of wrought iron in England from the year 1400 on, subdividing the 500 years into 10 periods which broadly tell the story of the metal.

On the subject of index numbers, the speaker said that, while it might be thought that the extent to which individual opinion enters into the selection of the commodities and their weights would make the results obtained widely different, this is not the case. On the contrary, a marked degree of resemblance is to be observed, the index numbers of the U. S. Department of Labor for this country and of Sauerbeck for England being cited as examples.

Appraisal and Valuation Methods and the Engineer

The topic of appraisal and valuation is essentially an engineering function and it is the duty of the engineer to develop, guide and control the method and procedure. This was the dominant note in a paper by David H. Ray, Pasadena, Cal. The engineer, he stated, is likely to be more familiar with the cost and value of materials, machines and structures than the lawyer or accountant, who in the past have been the only ones considered competent to direct this work.

An illustration of the functioning of the legal type of mind and the accountant type of mind in appraisal work is shown in a photograph reproduced in the paper, which pictures an appraisal in which nothing loose escaped being tagged. A spare screw the size of an anise seed was put in an envelope and two tags filled out in detail and attached; it was then inventoried and appraised by two men and listed and carried forward as a separate item. In the case of a set of 10 small stamping and numbering punches in a wooden box, a tag was made out for each number and one for the box. Every one of three dozen clamps shown on top of a shelf in the photograph had its own individual tag and appraisal valuation, signed and certified to by the initials of two men. Every jot and tittle of the law

was carried out. Thirty thousand tags were printed to appraise this one plant and were but half enough. In this plant, says the author, every machine was stripped to the casting. Chucks, spindles, collets, tool rests and holders were taken off the lathes, and tool centers, dividing heads and table equipment removed from the milling machines; in fact, all operative parts were taken off, collected, put in groups of a kind in another building, checked and listed.

No engineer, avers Mr. Ray, would spend 50 times the cost of a screw tagging it, nor make out 36 tags for three dozen identical simple tools in the same condition of wear. Nor would he think of making a collection of all the similar parts in a machine shop, for his sense of value would tell him a machine must be considered as a unit, as a going functioning entity for operation or for sale.

The paper points out that reports must necessarily depend on the purpose of the valuations and are divided by the author into two main groups, private and public. It is shown that the variables affecting values depend on labor, material and an aleatory factor to cover the general risk of business, with particular reference to marketing. Charts, curves and tabulations are given to show the change in these values during the period of the war, and terms used in appraisal work are defined. The paper also shows the desirability of giving a value to a machine as a unit, of the grouping of similar tools, and of the use of symbols in the form of numbers and letters in tagging the materials to be appraised.

Interest and Taxes During Construction

The subject of valuation was also touched upon in papers by H. C. Anderson, Ann Arbor, Mich., and by James Rowland Bibbins, Chicago. Proper allowances for interest and taxes during the period of construction, Mr. Anderson said, were items frequently ignored in the early days of appraisals, and of late excessive figures have been used. This has been the result of a disagreement on the part of engineers, not over rates of interest and taxes, for these are fixed, but over what constituted the construction period. Several methods are in use to determine the length of this period, and by means of examples the author discusses the relative merits and shortcomings of each.

Mr. Bibbins laments the failure of engineers to agree upon a codification of their definitions, methods and practices in valuation procedure, especially when ultimate decisions must finally rest upon the shoulders of courts, commissions, or non-technical bodies. A policy of open-minded co-operation, research and education along fundamental lines of economics is urged, rather than a continuance of purely partisan methods of thought and action.

The paper also emphasizes the breadth of view which a complete valuation should hold, in order to be of the fullest utility, especially with reference to the facts of history. Many try to ignore the past in valuation proceedings. Yet very large and definite equities are shown to exist which would be completely obscured without the necessary economic research. He suggested the possibility of ultimate federal regulation over industry such as that of the Interstate Commerce Commission over common carriers and outlined the probable effects of such a development. Charles Piez, president Link-Belt Co., he stated, had sounded the warning to industrial executives by frankly calling for perpetual inventories, valuations at original cost (except for insurance and comparisons of value in mergers), full recognition of depreciation and obsolescence as an integral part of the cost of product, writing off this shrinkage from capital at the maximum rate, rec-

ognition of maturing physical renewals rather than money values of the same, and proper accounting.

Fundamentally, the writer says, utilities and industries are not dissimilar as to the various aspects of valuation relating to the physical properties; and only the speculative element is shrouded in doubt, which at least is minimized in utilities subject to public regulation and protection.

Industrial Housing Discussed

Nelson Cunliff, chairman the Home and Housing Association of the St. Louis Chamber of Commerce, stated the housing shortage in this country will not be overcome until 3,340,000 new homes are built to restore the average of 100 houses to every 115 families. Only 20,000 homes were built in the United States in 1918, according to Government statistics, he said, and 20 times that number were needed for during the same period there were 1,040,000 marriages.

A paper by Leslie H. Allen, Springfield, Mass., treats industrial housing as a financial problem. Our housing shortage, he said, is due partly to the fear of a financial panic and partly to the fact that rents, high as they are, are not high enough to show an adequate return on present day construction costs. The relation of rents to capital invested, the calculation of proper rents, and methods of financing house construction are discussed in some detail in the paper. The financial difficulties which face those desiring to purchase new homes are also taken up and selling plans that will meet the purchasers' needs and their ability to pay are outlined. Finally, the author suggested a scheme of co-operative housing as a possible solution of the problem.

Tight-Fitting Threads for Bolts and Nuts

Although in general thread forms now in use are quite satisfactory, said Chester B. Lord, St. Louis, perfection by no means has been reached. The problem to be solved, he stated, is as follows: "Without sacrifice of strength, without increase of rejection, without additional manufacturing costs, find a method whereby a male and female thread of the same lead and pitch diameter may be made after repeated loosenings to fit right without the aid of a locking device." After presenting the reasons for departing from accepted practice and giving the results of experimental work, the paper offers the following conclusions: (1) The cause of stripped threads is lack of room into which the metal can flow; (2) The pitch diameter should be the same in both threads; (3) The lead should be the same; (4) The thread angle should differ by not more than 10 deg.; (5) The limits for the inside diameter of nut need not be adhered to closely, as the inner part of the nut thread holds very little, if any; (6) The outside diameter of plug and pitch diameter of both plug and nut are important and should be adhered to fairly closely.

"Writing Up" Investments to Current Prices

In discussing the papers on appraisal and valuation, Bion J. Arnold, consulting engineer, Chicago, deprecated "a very unfortunate element of expediency involved in the present controversies over the use of current pricing in appraisals." "In my opinion," he said, "much good money is wasted in an attempt to twist economic laws to suit the purposes of the present moment. Current pricing is, of course, directly applicable in certain instances, such as, for instance, sale, renewals, etc. But if engineers persist in confounding the fluctuating purchase price of money with basic capital investment, they will surely sooner or later run into the embarrassing situation of being forced to apply this same theory of current pricing to properties at a time when prices have slumped far below normal or cost. . . . This does not deny in any sense what is unquestionably a fact—that, if high prices are to remain, the capital investment must necessarily rise *gradually*, due to the higher prices paid for renewals or replacements, until ultimately the basic capital investment would reach a new, higher level. But this process cannot be suddenly brought about, as is assumed by those who contend for the universal use of present-day prices as in appraisals for all purposes except taxation."

Colonel Arnold agreed with a previous speaker

that the difference in valuation as applied to utilities and industries is one of degree and not of principle.

Symposium on Castings

Six papers designed to assist the mechanical engineer in intelligently specifying the proper kind of casting for a given piece of construction were presented and discussed at the foundry session, presided over by F. O. Wells, formerly president Greenfield Tap & Die Corporation, Greenfield, Mass. The aim of each paper was to outline the special properties of a particular kind of casting and where it is to be preferred to other forms of cast metal.

Dr. Richard Moldenke, Watchung, N. J., presented a discussion on gray iron castings. After touching on the carbon situation in cast iron, he dealt briefly with its chemical composition, giving in this connection a table of recommended compositions for many varied purposes. He called attention to the extent to which specialization has taken place in iron founding and enumerated the various classes of foundries and the lines of work to which they are best adapted. He urged that mechanical engineers let their work to foundries best fitted by their experience to handle it. In England and America, he said, strength in castings is given less attention than machineability, while the reverse is true in continental Europe. There the technical staffs of all foundries, from manager down to assistants in the several production and testing departments, are all graduate engineers. The consequence is that castings are made strictly for the purpose intended and not merely to get by the machine shop, as is unfortunately so often the case here.

Results of Excessive Use of Scrap During War

One of the by-products of the war, said Dr. Moldenke, was the excessive use of scrap by foundries; in some cases as high as 90 per cent to 10 per cent of pig iron. Within the next 20 years, he predicts, these castings running high in sulphur content will return to the melters in the form of scrap. The problem which will confront the foundries may be solved either by using more pig iron in mixtures or by employing a desulphurizing process. Until very recently, no method of removing sulphur was available but of late the electric furnace has been employed for this work with complete satisfaction. The molten metal is transferred from the cupola to an electric furnace with a basic lining. As the metal comes to the furnace hot, the extra cost of desulphurization is not great. The castings made are much better and sounder than the ordinary run, equalling charcoal iron castings made in the air furnace.

Permanent Versus Long-life Molds

The subject of permanent molds was brought up in the discussion of a paper on malleable castings by Prof. Enrique Touceda, Albany, N. Y., which was read by Prof. Arthur M. Greene, Rensselaer Polytechnic Institute, Troy, N. Y. Dr. Moldenke stated that he invariably found that castings made in iron molds were not as strong as those made in sand molds. In iron molds, he said, the metal is chilled so quickly that internal strains are set up. Permanent molds are not only unsatisfactory, but very expensive. Research work, he believed, should be in the direction of long-life molds rather than permanent molds. He cited work which had been done with molds lined with gas carbon mixed with pitch—a very refractory material. Fire brick has also been used successfully for parts of molds.

Malleable Iron Castings and the War

Capt. J. E. Hughes, Ordnance Department, U. S. Army, took exception to a statement in Professor Touceda's paper to the effect that malleable castings were not used as extensively for war purposes as they should have been, because Army officers were not familiar with their physical characteristics. Captain Hughes recited difficulties encountered in securing satisfactory malleable castings for various purposes and charged that malleable iron foundries were not doing the research work necessary to develop their product for Army

needs. Malleable castings for drop bombs, for instance, were found so porous that they would not withstand hydrostatic tests.

Dr. Moldenke suggested that perhaps Army specifications were too high, but agreed that porosity was characteristic of malleable castings. The latter, he said, are essentially white iron castings, the contraction of which runs as high as 12 per cent, resulting in an open structure on the inside with a series of planes of separation and generally a shrink spot in the center. He pointed out, however, that there is nothing better than a malleable casting under shock because of the cushioning effect of the amorphous carbon.

Cast Steel Unsuitable for Wearing Surfaces

The subject of steel castings was covered in a paper by John H. Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J., which was read by Prof. H. Wade Hibbard, University of Missouri. Mr. Hall dealt briefly with the physical properties of steel castings and their improvement through annealing and heat treatment, cost of castings and the classes of work for which steel castings should be specified. Castings are now made, the paper stated, with physical properties nearly twice as good as those of the ordinary commercial product, and where the service demands unusual strength, toughness and resistance to wear and fatigue, their use is urged even though they machine less freely. In discussing the extent to which cast steel has taken the place of forged steel, Dr. Hibbard stated that for wearing or rubbing surfaces cast material would not stand up because of its crystalline structure.

The trip made by convention visitors to the plant of the Commonwealth Steel Co. was referred to in the discussion, particular interest having been aroused by that company's method of molding tender and car frames as long as 45 ft. These double-body bolster castings were formerly made in green sand molds, but the difficulty in obtaining uniformity in weight and size and the frequency of scabby and imperfect castings resulted in the development of the present practice. A cast-iron molding form is used, having a bottom and four practically vertical sides, into which are built baked sand cores of proper size and shape so that when laid together like brick they form the cavities for a properly shaped mold. The mold is really constructed of both inside and outside cores, with cover cores secured to the molding form by means of clamps. The mold has 16 shrinkage risers and one pouring gate. To insure the fluidity of the steel, aluminum medicine is added to the ladle and only the hotter portion of the contents is used, the colder metal being utilized for smaller castings. To prevent distortion in shrinkage, the casting is removed from the mold before it has entirely cooled.

Die Castings

Whereas the permanent mold is not adapted to iron or steel castings, the die casting industry started with a permanent mold and found alloys suitable for its successful use, said Charles Pack, Doehler Die Casting Co., Brooklyn, in presenting his paper on die castings. Die casting, however, connotes forcing metal into a mold under pressure as distinguished from castings produced by merely pouring into permanent molds. The die casting process is best adapted to alloys of comparatively low fusing points, such as those of zinc, tin, lead and aluminum. While he stated that no general rules can be laid down governing the design and application of die castings, he nevertheless outlined general properties of the various alloys used and their fields of application, and gave particulars regarding such limitations as maximum weight of castings, minimum wall thickness, minimum number of threads and minimum diameter of holes that can be cast. The first commercial aluminum die castings, he stated, appeared on the market in 1914 and during the war a suitable steel was developed for making the dies for this process that would withstand the action of the molten aluminum without cracking. At the cessation of hostilities, 1,000,000 aluminum die castings were being produced daily in this country for parts of gas masks, machine guns, aeroplanes, motor trucks, motor ambulances, sur-

gical instruments, canteens, field binoculars and many other appliances of war.

Mr. Pack also presented a paper on aluminum castings in the absence of the author, Zay Jeffries, Aluminum Castings Co., Cleveland. A paper by C. H. Bierbaum, Buffalo, who was also absent, was presented. Following a short discussion regarding the terminology employed in designating alloys of copper, tin, zinc and lead, the author cites certain precautions which an engineer should take when specifying an alloy for a given service, and then deals briefly with the various deoxidizers and fluxes used in the brass foundry. A large part of the paper is devoted to an enumeration of the more important bronzes and copper alloys, their compositions, properties and uses being set forth in considerable detail.

Section on Machine Shop Practice Organized

A section on machine shop practice, which will study the design, construction and operation of metal-working machines, including tools and appliances, was organized at the convention. Prof. H. B. Fairfield, Worcester Technical Institute, was chairman of two informal sessions, at which the following nominating committee was selected: Ralph Flanders, Jones & Lamson Machine Co., Springfield, Vt.; Forrest E. Cardullo, G. A. Gray Co., Cincinnati, and C. B. Lord, St. Louis. This committee will select nominees for permanent officers, who will be elected by letter ballot.

Among the other papers presented at the convention were: "Simplification of Venturi-Meter Calculations," by Glenn B. Warren, Schenectady, N. Y., which describes a method devised by the author for the simplification of calculations involved in the venturi-meter measurement of the flow of compressed air, and reduces the work of one determination to a simple slide-rule computation requiring but a few settings; "Burning Eastern Coals Successfully on a Conveyor-Feed Type of Stoker," by Loyd R. Stowe, St. Louis, which describes a stoker developed by the Laclede-Christy Clay Products Co.; "The Separation of Dissolved Gases from Water," by J. R. McDermet, Pittsburgh, which covers the results of a research on the separation of dissolved gases from boiler feedwater, both on a laboratory and a commercial plant scale; "Pulverized Coal in Metallurgical Furnaces at High Altitudes," by Otis L. McIntyre, New York, which describes experiments which led to the installation of apparatus for the use of pulverized coal in the blast furnaces, reverberatories, and sintering machines of the Cerro de Pasco Copper Corporation at La Fundicion, Peru.

Good Attendance

The registration at the convention was 805 persons, of whom 475 were members. The program included various trips to nearby points of interest, including the Commonwealth Steel Co., Granite City, Ill.; the Ashley Street Power Plant of the Union Electric Light & Power Co., St. Louis; the St. Louis Boat & Engineering Co., the Busch-Sulzer Brothers Diesel Engine Co., the Mississippi Valley Iron Co. and the coke plant of the Laclede Gas Light Co. On the way to St. Louis, members stopped at Keokuk, Iowa, to inspect the plant of the Mississippi River Power Co. At the close of the convention a party went on to Tulsa, Okla., to visit the oil fields.

Stress Caused by Cold Rolling

WASHINGTON, June 1.—The Bureau of Standards has prepared for publication a technological paper, No. 163, dealing with the results of experiments with the stresses caused by cold rolling. The work was done by H. M. Howe and E. C. Groesbeck. The experimental data contained in the document show that a given amount of reduction by rolling causes less residual stress in the metal rolled if it is brought about by a large number of light drafts than if by a smaller number of heavy ones.

The American Steel Foundries recently resumed operation of its second open hearth furnace at its East St. Louis, Ill., plant, thereby adding 400 men to its previous working force of 700.

FREIGHT RATE HEARING

Granting of Wage Demands Would Require Some 60 Per Cent Advance in Rates

WASHINGTON, June 1.—Hearings on the application of the railroads for increased freight rates have been progressing before the Interstate Commerce Commission. Spokesmen for each of the main groups of roads have been heard. A considerable number of railroad officials have testified, the chief witnesses having been Howard Elliott for the railroads of the entire country, Daniel Willard for the Eastern roads, C. H. Markham for the Southern roads, and Samuel M. Felton for the Western roads. Following the conclusion of the testimony of the Railway Executives, an opportunity will be given for various shippers' organizations to be heard. It is expected that the hearings will run for two weeks or more, from June 7 to which date a recess was taken on Friday.

The Railway Executives urged emphatically that the full six per cent return on investment as allowed under the transportation act should be the basis of the revised rates as fixed by the Commission.

The need of new equipment was emphasized throughout the hearing. Mr. Felton pointed out that during Government control not a single passenger car was ordered. Mr. Felton said that the number of miles of railway abandoned during the last three years has been greater than the number built. The number of locomotives and freight cars ordered during the two years of Federal control would barely suffice to replace the number ordinarily retired in a year. He quoted Interstate Commerce Commission statistics showing that there was an actual decline of 206 in the number of locomotives in service in 1918 and an increase in the number of freight cars of only 1425. The statistics for 1919, he said, undoubtedly would show that in that year there was a further decline in the number of both locomotives and freight cars. The only way to remedy conditions and prevent disastrous results, Mr. Felton said, is to make large investments in railroads attractive. In view of the increased return on capital in other lines of industry, increased interest rates, and increased cost of all elements entering into railroad construction, he said that a return of six per cent is no greater than the necessities of the case demand.

That a large amount of new railroad mileage must be constructed in the Western territory was stated by Mr. Felton. He said, however, that this new mileage would not be built unless there was a fair prospect of a reasonable return being earned on additional investments.

The testimony before the Commission has brought out the fact that if wage advances are granted, such as are under discussion before the Railroad Labor Board at Chicago, the freight rate advance must be from 50 to 60 per cent, instead of an average of from 25 to 30 per cent, as asked by the roads to meet other increased costs. There has been considerable discussion as to just what the effect would be upon the public in the event of increased freight rates sufficient to provide for the increase in wages.

Revenue Law Simplified

WASHINGTON, June 1.—At the suggestion of Secretary of the Treasury Houston, the House of Representatives has passed an important measure to simplify the revenue act of 1918. The bill covers a series of administrative features that are of importance to taxpayers generally.

The most urgent of these, both in the judgment of Secretary Houston and of the House Committee on Ways and Means, is the section which authorizes the Commissioner of Internal Revenue with the approval of the Secretary of the Treasury and with the consent of the taxpayer "to make a final determination and settlement of any tax claim or assessment which shall not thereafter be reopened by the Government or modified or set aside by any officer, employee, agent or court of the United States, except on a showing of fraud, mal-

feasance, or misrepresentation of fact materially affecting the determination thus made."

"At present," says the letter of Secretary Houston, "the taxpayer never knows when he is through. Every time an old ruling is changed by court decision, opinion of the attorney general, or reconsideration by the department, the department feels bound to apply the new ruling to past transactions. The necessity of constantly correcting old returns and settlements is as distressing to the department as it is obnoxious to the taxpayer. But an even more serious situation arises in connection with the assessment of back taxes. The tax return of a large corporation is likely to be crowded with debatable points which the corporation in the first instance usually decides in its own favor. The auditing of these returns has been necessarily delayed by the inability of the Bureau of Internal Revenue to engage and hold a sufficient force of experts to audit promptly the more complex and difficult returns, but when the audit comes to be made, it ordinarily brings to light a large amount of back taxes. A prompt determination and collection of such back taxes due would bring in large additional revenue. On the other hand, this situation must fill the taxpayers concerned with gravest apprehension. If present taxes be continued and a period of industrial depression ensues during which the department finds the time and the men with which to clear up both current and back taxes within the same year, the result may be highly disastrous to business."

Conneaut Shovel Co. Plans for Own Rolling Mill

The Conneaut Shovel Co. recently acquired ten acres of land immediately west of its plant in Conneaut, Ohio. A rolling mill is to be built there at some future time. Excellent switching connections are assured, as the land lies between two railroads—the New York Central and Nickel Plate. The concern manufactures special shovels for various purposes.

Buys Coal Property

UNIONTOWN, PA., June 1.—George Whyel, prominent coal operator of this city, has purchased the Superior-Connellsville Coal Co. plant and 330 acres of the Pittsburgh vein in Luzerne township, this county, for \$1,175,000 and 180 acres of coal adjoining the Superior plant for \$350,000. He will electrify the Superior-Connellsville plant at an expense of \$100,000, making a total investment of \$1,625,000.

The following manufacturers announce the opening of a New York office at the Grand Central Palace, telephone Vanderbilt 2342, in charge of L. S. Devos, formerly at 120 Liberty Street, New York: Monarch Machine Tool Co., Sidney, Ohio; Whipp Machine Tool Co., Sidney, Ohio; Stockbridge Machine Co., Worcester, Mass.; Giddings & Lewis M. T. Co., Fond du Lac, Wis.; Ott Grinder Co., Indianapolis; American Milling Machine Co., Cincinnati; U. S. Machine Tool Co., Cincinnati; U. S. Drill Head Co., Cincinnati; La Salle Tool Co., La Salle, Ill.; T. R. Almond Mfg. Co., Ashburnham, Kan. A permanent demonstration exhibit as well as a limited stock of the above manufacturers products will be maintained at the Grand Central Palace.

Three Columbia, Pa., iron mills recently purchased by new companies, are now undergoing extensive repairs preparatory to reopening within the next several weeks. The Columbia Rolling Mill and the Susquehanna Rolling Mill, which had been idle for two years, recently purchased by the Reading Iron Co., Reading, Pa., will start, the first within a fortnight and the latter at an early date. The former will employ 350 men and the latter 250. The Superior Sheet and Tube Co., Youngstown, Ohio, which recently purchased an old pipe mill which had been idle for several years, plans to start operations in it in June and it is expected will employ about 500 men.

RECOVERY IN IRON OUTPUT

Production in May 5,088 Tons More Daily Than in April

Net Gain of 14 Furnaces—Manganese Alloy Output Heaviest This Year

There has been a decided recovery in the output of the blast furnace industry in May as compared with April but the effect of the railroad strikes and the demoralized condition of transportation is still in evidence. The recovery in May from the low output in April has been about 33 per cent.

The production of coke and anthracite blast furnaces in May, a 31-day month, amounted to 2,988,881 gross tons, or an average of 96,415 tons per day, as compared with 2,739,797 tons or 91,327 tons per day in April, a 30-day month, and 3,375,907 tons, or 108,900 tons per day in March, a 31-day month.

The output of manganese alloys was the largest for any month this year, having been 36,242 tons of ferromanganese and spiegeleisen in May against 27,628 tons in April and 35,275 tons in March, the latter having been the largest output up to that time in the year. The ferromanganese output in May was 23,562 tons, also the largest for any month this year.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, from May, 1919, is as follows:

Daily Rate of Pig Iron Production by Months—Gross Tons			
	Steel Works	Merchant	Total
May	51,187	16,815	68,002
June	51,865	18,630	70,495
July	61,503	16,837	78,340
August	68,018	26,478	88,496
September	60,954	21,978	82,932
October	41,796	18,319	60,115
November	57,589	22,156	79,745
December	61,815	23,129	84,944
January, 1920	72,015	25,249	97,264
February	75,230	27,490	102,720
March	80,021	28,879	108,900
April	65,168	26,159	91,327
May	70,185	26,230	96,415

The figures for daily average production, beginning with January, 1914, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1914—Gross Tons							
	1914	1915	1916	1917	1918	1919	1920
Jan. 60,808	51,659	102,746	101,643	77,799	106,525	97,264	
Feb. 67,453	59,813	106,456	94,473	82,835	105,006	102,720	
Mar. 75,738	66,575	107,667	104,882	103,648	99,685	108,900	
Apr. 75,655	70,550	107,592	111,165	109,607	82,607	91,327	
May 67,506	73,015	108,422	110,238	111,175	68,002	96,415	
June 63,916	79,361	107,053	109,002	110,793	70,495		
July 63,150	82,691	104,017	107,820	110,354	78,340		
Aug. 64,363	89,666	103,346	104,772	109,341	88,496		
Sept. 62,753	95,085	106,745	104,465	113,942	82,932		
Oct. 57,361	100,822	113,189	106,550	112,482	60,115		
Nov. 50,611	101,244	110,394	106,859	111,802	79,745		
Dec. 48,896	103,333	102,537	92,997	110,762	84,944		

Production of Steel Companies

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies, as well as from merchant furnaces producing ferromanganese and spiegeleisen, show the following totals of steelmaking iron, month by month, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons						
	Total production—			Spiegeleisen and ferromanganese		
	1918	1919	1920	1918	1919	1920
Jan.	1,756,208	2,430,022	2,232,455	30,695	32,787	23,957
Feb.	1,620,254	2,209,470	2,181,679	26,114	28,105	28,038
Mar.	2,349,419	2,277,507	2,480,668	39,122	26,644	35,275
Apr.	2,411,488	1,838,677	1,968,542	35,511	17,308	27,628
May	2,512,577	1,586,805	2,175,742	54,633	14,604	36,242
June	2,407,166	1,655,944	.....	44,844	14,254	.....
July	2,456,693	1,906,604	.....	51,762	14,805	.....
Aug.	2,509,357	2,108,566	.....	54,009	17,419	.....
Sept.	2,507,381	1,828,613	.....	66,275	20,631	.....
Oct.	2,594,277	1,295,690	.....	70,379	20,238	.....
Nov.	2,501,867	1,727,656	.....	59,638	19,964	.....
Dec.	2,524,794	1,916,249	.....	49,435	15,718	.....

Diagram of Pig Iron Production and Prices

The fluctuations in pig iron production from 1910 to the present time are shown in the accompanying chart. The figures represented by the heavy line are those of daily average production by months of coke and anthracite iron. The dotted curve on the chart represents monthly average prices of Southern No. 2 foundry pig iron at Cincinnati, local No. 2 foundry iron at furnace at Chicago, and No. 2 X at Philadelphia. They are based on the weekly quotation of THE IRON AGE.

Production of Coke and Anthracite Pig Iron in the United States by Months, Beginning Jan. 1, 1916—Gross Tons

	1916	1917	1918	1919	1920
Jan. ..	3,185,121	3,150,938	2,411,768	3,302,260	3,015,181
Feb. ..	3,087,212	2,645,247	2,319,299	2,940,168	2,978,879
Mar. ..	3,337,691	3,251,352	3,213,091	3,090,243	3,375,907
Apr. ..	3,227,768	3,334,960	3,288,211	2,478,218	2,739,797
May ..	3,361,073	3,417,340	3,446,412	2,108,056	2,988,881
5 mos.	16,198,865	15,799,837	14,678,781	13,918,945	15,098,645
June ..	3,211,588	3,270,055	3,323,791	2,114,863	.....
July ..	3,224,513	3,342,438	3,420,988	2,428,541	.....
Aug. ..	3,203,713	3,247,947	3,389,585	2,743,388	.....
Sept. ..	3,202,366	3,133,954	3,418,270	2,487,965	.....
Oct.	3,508,849	3,303,038	3,486,941	1,863,558	.....
Nov.	3,311,811	3,205,794	3,354,074	2,392,350	.....
Dec.	3,178,651	2,882,918	3,433,617	2,633,268	.....
Total, yr.*	39,039,356	38,185,981	38,506,047	30,582,878	.....

*These totals do not include charcoal pig iron. The 1918 production of this iron was 347,224 tons.

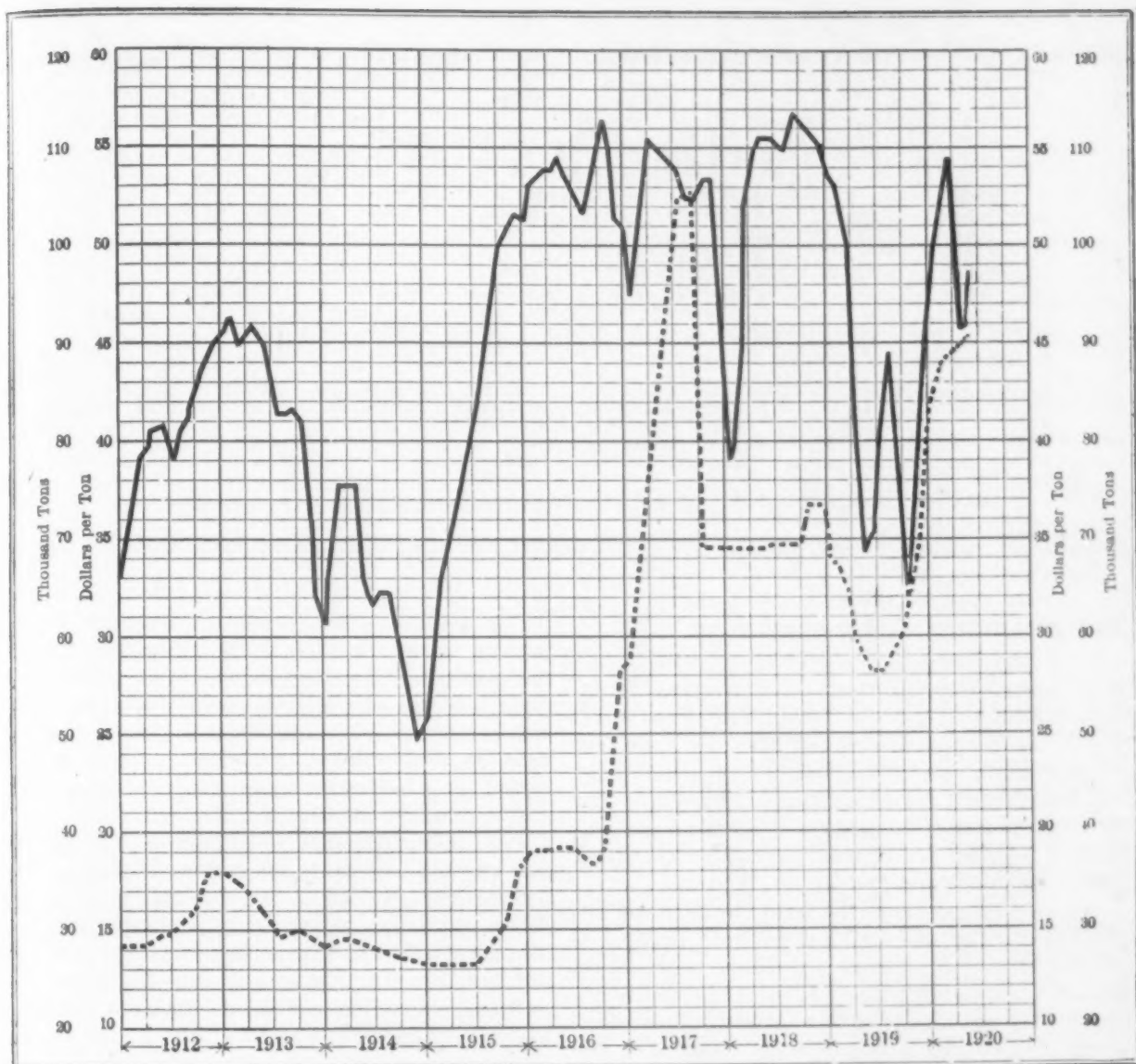
Output by Districts

The accompanying table gives the production of all coke and anthracite furnaces for May, and the three months preceding:

Pig Iron Production by Districts—Gross Tons				
	May (31 days)	Apr. (30 days)	Mar. (31 days)	Feb. (29 days)
New York	220,820	175,708	210,036	158,710
New Jersey	9,366	6,181	4,789	1,961
Lehigh Valley	89,639	89,046	90,271	65,881
Schuylkill Valley	97,784	85,617	101,399	94,541
Lower Susquehanna and Lebanon Valleys	68,342	60,505	43,136	32,808
Pittsburgh district	652,940	641,159	746,933	686,903
Shenango Valley	62,297	74,054	162,845	147,358
Western Pennsylvania	185,062	181,446	192,500	163,092
Maryland, Virginia and Kentucky	116,063	106,914	101,248	82,345
Wheeling district	119,015	105,191	143,905	117,597
Mahoning Valley	177,589	169,496	306,720	290,485
Central and Northern Ohio	289,137	272,896	315,551	284,985
Southern Ohio	74,206	95,922	78,486	77,443
Chicago district	476,773	388,063	538,215	466,453
Mich., Minn., Mo., Wis., Colo. and Wash.	112,395	97,488	111,552	99,244
Alabama	212,246	191,389	204,816	185,237
Tennessee	25,207	24,722	23,582	23,836
Total	2,988,881	2,739,797	3,375,984	2,978,879

The furnaces blown in include one Susquehanna in the Buffalo district; the Robeson furnace in the Lebanon Valley; one Isabella furnace and one Monessen in the Pittsburgh district; the Claire furnace in the Shenango Valley; one Johnstown furnace of the Cambria Steel Co. in Western Pennsylvania; one furnace of the Virginia Iron & Coke Co. in Virginia; one Mingo furnace of the Carnegie Steel Co. in the Wheeling district; the Anna furnace, one furnace of the Brier Hill Steel Co., the Mattie furnace and one furnace of the Youngstown Sheet & Tube Co. in the Mahoning Valley; one American Steel & Wire Co.'s furnace, the Franklin furnace of the Carnegie Steel Co., and the Upson furnace in Central and Northern Ohio; the Ironton and Lawrence furnaces of the Marting Iron & Steel Co. in Southern Ohio; one South Chicago (new) in the Illinois district and one Gary furnace in the Indiana district; one furnace of the Ford Motor Co. in Michigan; one City furnace of the Sloss-Sheffield Iron & Steel Co., and one Bessemer and one Ensley furnace of the Tennessee Coal, Iron & Railroad Co. in Alabama.

Among the furnaces blown out or banked are the Genesee furnace in New York State; three Bethlehem



The Full Line Represents the Daily Production of Pig Iron and the Dotted Line Is the Average of the Price Per Ton of No. 2 Southern Pig Iron at Cincinnati, Local No. 2 Iron at Chicago and No. 2X Iron at Philadelphia

furnaces in the Lehigh Valley; one Josephine and the Scotdale furnace in Western Pennsylvania; one Ohio furnace of the Carnegie Steel Co. and one Hubbard furnace of the Youngstown Sheet & Tube Co. in the Mahoning Valley, and the River furnace in the Central and Northern Ohio districts.

Blast Furnace Notes

There are still eight furnaces in the Shenango Valley either banked or not operating because of the effect of the railroad strike. The output in that district was nearly 12,000 tons less in May than in April.

One River furnace in the central and northern Ohio district is out for relining.

The Genesee furnace in the New York district was banked in May and is still out.

There are nine blast furnaces throughout the United States now producing ferromanganese and four companies using electric furnaces producing the same alloy.

The Clark Equipment Co., Buchanan, Mich., manufacturer of high speed drills and tools, announces that the policy of granting vacations with pay to all employees who have been with the company one year or more will be continued.

The American Clay Machinery Co., Bucyrus, Ohio, has been changed to the Hadfield-Penfield Steel Co.

Extensions which will increase its capacity 60 per cent are being made by the Falcon Bronze Co., Youngstown, Ohio, manufacturer of non-ferrous alloys. Its products go almost wholly to iron and steel plants. One furnace is being added, which will give the company four. The enlarged capacity will be ready for production about July 10.

Gas Products Association, Chicago, will hold its summer convention at Mackinac Island June 21 and 22. The party will leave Chicago on the Missouri June 19 and cruise northward to Mackinac Island, where for two days there will be a get-together meeting. The Gas Products Association is composed of manufacturers of electrolytic oxygen and hydrogen.

The Youngstown Boiler Tank Co., Youngstown, Ohio, has increased its capital from \$100,000 to \$500,000, to provide for increasing business. The company has recently tripled the capacity of its plant. It specializes in the production of steel storage tanks of all sizes. James B. Keene is president.

In the training department of the Pittsfield, Mass. Works, General Electric Co., there are 130 apprentices, approximately 25 per cent of them high-school graduates and the remainder grammar school graduates. Of the 130 apprentices, 26 will be graduated this year.

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The Beginning of Co-operation

The admirable paper by C. L. Close, manager Bureau of Safety, Sanitation and Welfare, of the United States Steel Corporation, read at the meeting of the American Iron and Steel Institute last Friday, was a very comprehensive review of what has been done by steel companies, especially the Steel Corporation, to make the lives of the employees happier and it was deserving the special vote of thanks suggested by Mr. Schwab.

In very recent years the term "welfare" as applied to work of this kind has not been popular in certain circles on account of alleged patronizing features, and labor leaders have denounced it because they realized that it was resulting in non-union men becoming more closely attached to the companies by which they were employed. Mr. Gompers went so far as to call it "hell-fare work" and others were hardly less violent. Doubtless there was ground for reasonable criticism of certain features of such work, but for some time anything of a patronizing character has been carefully avoided. This is pointed out particularly by Mr. Close in speaking of the Americanization plans which have been so successfully carried out. Many different methods for the Americanization of foreign-born people have been advocated, but Mr. Close is convinced that no better method can be employed than the training in the public schools and the intelligent use of such other facilities as are already in existence in the industrial centers. He points out that the public school is a democratic institution without restrictions as to race or creed and above all is free from patronage. The foreigner is not timid about entering the building and feels that it is his right to go to the place where his children are being educated. The other facilities referred to include libraries and places for meetings, found in many schools.

In considering the many phases of the welfare work of the Steel Corporation, one is impressed by the fact that very little of it would ever even have been attempted if it had been left to the employees. This is because much of it, such as accident prevention, sanitation, dental clinics, nursing and housekeeping, requires thoroughly trained

teachers. It would be unreasonable to expect employees to deduct liberally from their pay to provide for physicians, surgeons, dentists, nurses and other experts who are now rendering such splendid service in many industrial plants. Certainly labor leaders have not pointed out any plants in which employees have carried on this work without company leadership and assistance.

Another criticism which could be made is that the co-operative work referred to above does not go far enough. If, as was pointed out by Mr. Close, more than 20,000 men have co-operated with the corporation in preventing accidents and 5000 men are now working on accident prevention committees, why could not the employees co-operate in considering other questions which relate to the welfare, including hours of labor, working conditions and the security of the individual worker in his position? If it be answered that for employees to take up these questions would be setting a dangerous precedent, it may be asserted that the precedent has already been set. That the years of co-operation along a few lines have not resulted in the men grasping for authority in other directions suggests that another progressive step need not be considered dangerous.

Cycles and Prices

It has come to be accepted that business moves in a cycle and that it is natural for it to do so. Years ago, when these matters had not been studied as they have been of late, it was a common view that business would move along smoothly and regularly were it not for a certain nasty intruder, a "panic." Everything would be all right were it not for these unnecessary and periodic intrusions. The later view is that the panic is merely one incident, and not a necessary one, in the cycle.

Why, however, any cycle at all? The reason seems to be that we are speculative and timid. We make purchases and engage in new enterprises spurred by the expectation of higher prices, and when that expectation is not realized our timidity asserts itself. The change from over-confidence to timidity causes prices to fall and thus the

timidity is apparently fully justified. When the change is sudden there is a "crisis," which is not necessarily a "panic," for according to the approved nomenclature a panic has to do chiefly with the money market.

It seems to be very largely a case of men bringing to pass by their acts the things they expect. Using the term "buying" in the broad sense of spending money, whether for a commodity, for labor, or for a factory, when men fear or expect an advance in cost they buy and thus cause or assist the advance, and when they fear or expect a decline they refrain from buying, and thus cause or expedite the decline.

Business men have had occasion to look at this matter from a very practical viewpoint. They have been confronted with the question whether it would be advantageous for them voluntarily to reduce their prices, simply in order to hasten the time when conditions would be ripe for another upward swing. It is not often that such action has really been taken, but it is quite conceivable that if all sellers had been in position to act in concert according to one counsel, that of the majority, such forced price declines would not infrequently have been arranged.

Absolute price stability is, of course, impossible, for costs of production would vary somewhat even if raw materials and wage rates remained absolutely fixed. The great swings in business could be avoided, however, if prices could be kept from changing except at a slow rate. The act of buying or the decision to refrain from buying is in anticipation of a change in prices. The change expected must be a very material one, or it does not pay to act upon it. If, for instance, the investor who contemplates erecting a building counted on to yield a certain return year by year foresees a decline in the cost of erection that is less than the expected profit he will not wait, for he would lose more than he saved. On a rising market, again, he may invest sooner than he desires because he foresees a rapid rise in cost, while if he believed the cost would increase but slowly he would find it advantageous to wait.

When it is recognized that business moves in a cycle the important thing is to determine what stage of the cycle we are in at a given moment. A business reaction, or a crisis, something still more pronounced, or a panic, a stronger affair still, follows a realization that prices have ceased advancing. The intensity of the movement depends upon how sudden the realization is. One can see that in the present case it has been gradual. Men have not been shocked by sudden recognition that prices have ceased advancing. Rather they were hoping anxiously that prices would decline before they perceived any prospect that their hopes might be realized. Even now the average man's judgment is that prices will decline less than he wishes they would. There may be important readjustments in price relations, for some commodities are much higher than usual in relation to others, production costs and all other factors being taken into consideration, but no great decline in the average level could occur except through the medium of a prolonged industrial de-

pression. For that, it is quite certain the country has no time. There is too much work to be done.

Better Basic Steel

There is a marked tendency at present to improve in every way possible the quality of basic open-hearth steel. The preference for acid open-hearth steel, particularly where the service is unusually exacting, has long been recognized. The reasons for this and the exposition of typical acid open-hearth practice were well presented last week before the American Iron and Steel Institute, and the paper is abstracted elsewhere in this issue. Acid steel is called for in various specifications for ordnance material and marine forgings and castings and has been considered superior for certain other uses. While most American makers of rolled products use the basic process, a few employ the acid open-hearth furnace for bars and for parts used largely in the automobile industry.

One of the incentives to improve basic open-hearth steel is not only this use of acid open-hearth product but the competition of electric steel as well. While electric steel can scarcely be improved on where quality is desired, the advantage is claimed for the acid open-hearth that a larger amount, forty or fifty tons, of such carefully made steel is possible in one heat, giving a large quantity of quality steel in one manipulation. The largest heats of electric steel in this country are 30 tons and these are the exception. They are refined also on a basic bottom.

One factor in the improvement of basic open-hearth steel is the employment of a comparatively new alloy, first made in quantity during the war, namely, 10 to 15 per cent electric ferrosilicon. Its use as a substitute for the 50 per cent grade in basic practice is expanding. The advantage is that it can be introduced into basic steel in the bath, in contrast with the addition of the 50 per cent alloy in the ladle. It is also unusually pure as to sulphur, phosphorus and other ingredients.

As has been pointed out before, the tendency continues to be toward the production of quality steel in quantity. The realization of this aim involves the making of as much of the steel as possible in the furnace itself and not in the ladle. In acid open-hearth practice rightly carried out the steel is finished before it leaves the furnace.

British papers refer to a boom in the Sheffield steel trade that is unprecedented. They point to this as an evidence of the world's hunger for steel and say that steel makers are overwhelmed with orders. That this wave of prosperity will last for several years is also confidently predicted. The number of unemployed men is decreasing each week and the demand for skilled labor is far in excess of the supply. A hopeful sign is the gradual disappearance of the feeling of "war-weariness" and the development of greater efficiency. There is also a disposition among employees to take advantage of the offers of stock by various companies and it is reported that in one large Sheffield steel company 64,000 shares are held by

employees. This news is an encouraging indication of the gradual return of British industry to sanity and the example is one that might well be followed to a greater extent in the United States.

The Future's Iron Requirements

Ever since the discovery was made that the pig-iron production of the United States had a habit of doubling every ten years, with occasional but not serious variations, there has been a disposition to make comparisons between what the rule would call for and what had recently occurred. Occasionally the comparison has been made for the purpose of showing that performance had not lived up to the rule, and that therefore there was a "shortage" that would have to be made up very speedily. Not everyone can have patience with such an invocation of the so-called "rule." The argument is that if the rule and the performance do not agree there is something wrong with the performance. It is more practical to assume that the lack of performance makes it look bad for the rule. No such line of argument will be followed in these remarks.

Assuming that the production of pig iron this year comes out at an even 40,000,000 tons, ten-year totals of outputs will be as follows:

Ten years ended—	Gross Tons
1870	11,366,963
1880	24,055,278
1890	56,902,041
1900	98,124,754
1910	211,321,934
1920	325,717,114

Ignoring for the moment the decennial period now ending, this grouping of the years shows for each period more than a doubling, with the exception of the last decade of the old century. A long range comparison is quite complimentary to the rule. The production in the ten years ended with 1910 is 16 per cent more than 16 times the production 40 years earlier, 10 per cent more than eight times the production 30 years earlier and only 7 per cent less than four times the production 20 years earlier. In other words, the geometric ratio slowed down very gradually indeed.

The production in the ten years now ending is only 54 per cent more than the production ten years earlier, this being by far the greatest slowing down that has ever occurred. There has not been as great a sprinkling of lean years as in the decade ended with 1900, while furthermore there was the special demand of the war. However, the war discouraged the ordinary consumption of iron and steel and greatly encouraged the creation of facilities for iron and steel manufacture. The common view is that we have the combination of excellent prospects for iron and steel consumption and of large facilities for supplying the demand.

It would be a conservative view, in the light of the history summarized in the table above, that the production in the ten years following this year will be 54 per cent greater than production in the ten years now ending. That would make 500,000,000 tons for the period. Even that would be

an average quite in excess of the present capacity, so that capacity would have to be increased within a very few years, even on the basis of this very conservative expectation as to requirements.

The argument is reasonable that since iron products are largely used for construction purposes, if a certain work has been done, if facilities have been created, they do not need to be created again. One may say, for instance, that the railroads used to be the great iron and steel consumers, but the railroads are now built, and merely need to be expanded somewhat and kept in repair. The case of the railroads, however, really furnishes an argument on the other side. It is not now that the period of heavy railroad demand is ending. The ending occurred just 13 years ago, in 1907. Since then the railroads have taken a much smaller proportion of the iron and steel output than formerly. The recent growth in total demand has been not on account of increased railroad buying, but despite a great decrease in railroad buying.

Steel products have become ubiquitous. There is no single large customer of the steel industry. There are more than a score of varieties of two-inch pipe, because there are different classes of buyers of a certain material, for different uses, the material all being of two-inch size. The merchant bar mills turn out thousands of sections and sizes. Steel sheets show great varieties in width, length, thickness, texture of material and surface finish. It is safe to say that considering size, shape and quality the steel industry produces scores of thousands of different pieces of material. That is testimony to the breadth of the popular demand. Some of the lines of demand are bound to increase very rapidly. There is room for many to fall away, as in the case of the steel railroad tie, so much talked of more than a decade ago, which showed a production of only 6438 tons in 1918.

Improvement in the Coke Region

UNIONTOWN, PA., June 1.—The last week in the Connellsville coke region has seen a distinct improvement in car placements; an apparent break in the speculation which has sent coal and coke to record prices and generally a more optimistic spirit, although the market, broadly speaking, is what may be termed listless.

Demands of shipping interests for fuel for loading boats at piers shot the price of coal last week to \$8.25, although this was an exception. Some sales were made at the price. Quotations for coke remain at \$15, ovens.

Despite the fact that the time has passed in which second half or third quarter contracts usually are concluded, there have been no contracts, so far as recorded, made for the last half of the year. Consumers seem to be holding off to determine the outcome of the present industrial tangles. Shipments usually are in train load lots, few shipments being made in single car consignments.

Cartridge Plant Purchased

Morey & Company, Inc., machinery and supplies, New York, have purchased the entire equipment of the cartridge plant of the New York Air Brake Co., Watertown, N. Y., which includes all of the large presses. Many of these presses have already been sold to one of the best known manufacturers in England, to be used for making Ford parts in England. A number of the presses have also been disposed of to a large Canadian steel company.

American Engineers and Iron Ore Development in Celebes

Alex L. Ter Braake, mining engineer for the Government of the Netherlands, Colonial Department, has been in the United States for several weeks in the interest of his Government in the development of iron ore in the Dutch East Indies. Enormous deposits of nickel and chromium bearing iron ores have been discovered by Mr. Ter Braake and associates on the Celebes Island. Adjoining the ore deposits are available water power sites capable of producing continuously 200,000 hp., and in the same region other water powers can be developed to produce an additional 800,000 hp. All of the raw materials necessary for steel works operation excepting coal are within easy reach of the ore deposit.

This ore somewhat resembles the large deposit of chrome nickel iron ore owned by the Bethlehem Steel Co., Midvale Steel Ordnance Co. and others in Oriente Province, Cuba. It is superior to the chrome nickel ore of Cuba, as it has half the contents of silica and alumina found in the Cuban ore, less chromium, and is to a great extent in lump form.

The Government of the Netherlands proposes to use electric furnaces for the production of pig iron similar to those operating at Throllhattan, Sweden, and contemplates the erection of a steel plant for the annual production of at least 60,000 tons of finished steel products, principally rails and other track material for use in Java and the Dutch East India Colonies.

Carney & Lindemuth 40 Wall Street, New York, have been retained by the Government of the Netherlands to assist in the development of this property.

Large Expenditures Planned by the Père Marquette Railroad

DETROIT, June 1.—A program of extensions and improvements that will cost \$21,000,000 has been mapped out by the Père Marquette Railroad for 1920, provided the roads are granted the 30 per cent increase recently asked, is the announcement of Frank H. Alfred, president of the company, on his return from an inspection trip over the entire railroad system. Saginaw, Mich., will be the first city to benefit under this program, plans having been made for a \$1,000,000 roundhouse in that city. Larger freight houses and a bridge across the Saginaw River will follow. Temporary additions will be made to the present freight yards and additions will follow next year. The plans for the roundhouse include provision for a 30-engine unit, having 150-ft. stalls, and connecting machine shop for emergency repairs. The existing machine shops will have to be immediately enlarged to provide for the immense amount of repair and reconstruction, work necessary as a result of war conditions.

Priority Orders to Help Tin Plate Mills

WASHINGTON, June 1.—The Interstate Commerce Commission has issued priority orders to insure adequate shipments of tin plate in sections where canning factories are located. This action follows the application of the National Canners' Association. The traffic tie-up, it is contended, has resulted in a serious situation in the canning industry through inability of the canning factories to obtain their usual supply of tin plate.

It has been customary in the past for the can makers to store with the canners where the cans are to be used, 60 to 70 per cent of the season's supply in advance. Up to the present time, not more than 30 per cent of the usual advance deliveries for the coming season have been made. There is in operation at the present time not more than 25 per cent of the can making capacity of the country, owing to the shortage of tin plate. The can makers have used up all available stock of tin plate and the tin plate mills in turn are being compelled to curtail production because of the lack of transportation facilities for steel and fuel. The tin

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plate mills during the past six weeks have not been running at more than 25 per cent capacity, and many of them are shut down entirely.

It is declared that at least 500 box cars per day are needed in the Pittsburgh, Baltimore, Chicago, Indianapolis, Wheeling, Cincinnati, and Rochester districts to transport the tin plate from the mills.

Many Ships Building

WASHINGTON, June 1.—Private American shipyards were building, or under contract to build, for private owners of 348 steel merchant ships on May 1, according to the records of the Bureau of Navigation of the Department of Commerce. These ships totaled 1,391,341 gross tons. Each month's figures show an increase in ship construction for private owners. On April 1, 321 steel ships of 1,252,096 gross tons were building, or under contract to build, while on Jan. 1 there were 165 of 679,170 gross tons. These figures do not include Government ships.

During the month of April new contracts entered into included four vessels constructed by George A. Fuller, Wilmington, N. C., of 6700 gross tons each for builder's account, to be launched between September, 1920, and January, 1921; seven vessels with the Northwest Bridge & Iron Co., Portland, Oregon, of 8450 gross tons each for the Swiftsure Oil Transportation Co.; two vessels with the Texas Steamship Co., Bath, Me., of 6700 tons each for builder's account; and four with the Union Construction Co., Oakland, Cal., of 5606 gross tons for the Anglo-Saxon Petroleum Co.

Iron and Steel Markets

RECOVERY IN PIG IRON

Gain for May Averages Over 5000 Tons a Day

Signs of Rapid Railroad Improvement—Easier Sheet Bars—Tin Plate Priorities

Pig iron production figures wired to THE IRON AGE from all districts on the first day of June show a total for May of 2,988,881 gross tons. This is an average of 96,415 tons per day and compares with a total of 2,739,797 tons in April, or 91,327 tons per day. Thus there was a recovery of about 5000 tons per day from the strike slump in April to 17,000 tons per day below the March rate.

It is still the outstanding fact in the industry that output is best nearer the raw material end. While shipments of finished steel are again slightly better this week, the Pennsylvania Railroad leading in the improvement, pig iron is picking up faster. Furnaces in blast June 1 numbered 295, against 281 on May 1 and 312 on April 1. Resumption of a number of blast furnaces is planned for the coming week.

Cross currents are indicated by the report from the Philadelphia market that even the moderate increase in shipments has started new inquiry, while against this in other quarters the market is still quite inactive, with some requests from automobile manufacturers for cancellations or suspensions, particularly on special steels.

A rapid return to normal railroad operation is now expected, and as soon as adequate stores of fuel are collected an expansion of iron and steel plant activity will ensue, following increased activity in the week in rolling mills.

How much the recent falling off in buying is due to the discouraging delays and indefiniteness of deliveries or to a conservatism growing out of the general labor uncertainties is as yet indeterminate, but no promise of closing the gap between demand and supply is shown except in structural material and plates. The easier situation in these respects is no more marked than in the last few weeks and is shown more in a reduced volume of buying than in less bookings at the top prices.

Without specific explanation, unless the result of the heavier than usual movement while finishing mills were down in the first period of the strike, the upper prices of Bessemer and open-hearth sheet bars have been cut \$5 per ton.

Due to the railroad improvement, the operation of sheet mills of the American Sheet & Tin Plate Co. has gone up to 85 per cent of normal sheet mill capacity, while independent producers have reached 65 to 70 per cent. In some cases independent sheet mills have quoted prices nearer those of the Steel Corporation. In the Chicago district, despite fresh local railroad difficulties, active steel plant capacity is now over 75 per cent. An accumulation of 15,000 tons of finished steel occurred in the week.

Concerted effort is being made by the railroads to get tin plates forward to the can makers, and

there was some reduction last week in the heavy stocks at mills. This movement will go farther, seeing that the Interstate Commerce Commission has made a priority order for tin plates for cans.

Inquiries for basic pig iron now amount to about 20,000 tons, of which half is for an eastern company and half for an Ohio steel maker. The Norfolk & Ohio Railroad is in the market for 5000 tons of foundry and malleable iron. With these exceptions the inquiries pending are for small tonnages and the market as a whole is extremely quiet, but prices are firmly maintained. Foundries continue to operate under great difficulty, owing to the slow delivery of pig iron and coke. The activity of jobbing foundries is taken as an indication that users of castings are busily engaged. Foreign inquiry exceeds the tonnage available for export.

Railroad equipment buying is not wholly suspended awaiting arrangements for floating car trust certificates in connection with an appropriation from the so-called revolving fund. The Illinois Central has bought 77 locomotives, the Atlantic Coast Line 500 cars and the Chesapeake & Ohio 1000 cars. Other car orders total about 850. The Big Four is in the market for 3000 cars and the Bessemer & Lake Erie for 500. A western road has bought 500,000 tie plates, or 3000 tons, but delivery is indefinite.

Rail inquiries have been received from a number of lines for 1921 delivery, but quotations on next year's business are not willingly given.

Structural steel items include 9000 tons placed for the electric light and power house in New York. Bids have been opened on 15,500 tons for six piers at Staten Island, New York. Among plate inquiries are 13,000 tons wanted by the Pennsylvania Railroad and 16,000 tons sought by a Pacific Coast shipyard.

Though output is increasing, Great Britain's iron and steel exports are hardly 50 per cent of her 1913 volume, whereas the April exports from the United States were at a rate of over 90 per cent of those figures. Britain's shipments abroad of pig iron and tin plate are as yet quite subnormal and the United States is only exporting a fraction of these totals, but in bars, shapes, plates and wire, in which the British business is that of the pre-war volume, the United States is shipping two times as in bars to seven times as in wire.

Pittsburgh

PITTSBURGH, June 1.

The local railroad situation is looking better, especially on the Pittsburgh & Lake Erie Railroad, this road having been affected more seriously by the railroad strike than any of the other local roads. On Saturday the shop men of the Pittsburgh & Lake Erie held a meeting at McKees Rocks and voted to return to work. This means that all the shop men at McKees Rocks, Hazelton, Dickerson Run and other places who have been out on a sympathy strike will resume work at once, and it is believed their action will have the effect of causing many of the yard men and switchmen who are still out on strike to go back to their jobs. This is the most important break in the ranks of the strikers since the unauthorized railroad strike started, early in April.

Conditions on the Pennsylvania and on the Balti-

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	June 1, 1920	May 25, 1920	May 4, 1920	June 3, 1919
No. 2 X, Philadelphia...	\$47.15	\$47.15	\$47.05	\$29.50
No. 2, Valley furnace...	45.00	45.00	43.00	26.75
No. 2, Southern, Cin'ti...	45.60	45.60	45.60	28.50
No. 2, Birmingham, Ala...	42.00	42.00	42.00	25.75
No. 2 furnace, Chicago...	43.00	43.00	43.00	26.75
Basic, del'd, eastern Pa...	44.80	44.80	44.80	29.65
Basic, Valley furnace...	43.50	43.50	43.00	25.75
Bessemer, Pittsburgh...	44.40	44.40	43.90	29.35
Malleable, Chicago...	43.50	43.50	43.50	27.25
Malleable, Valley...	44.00	44.00	43.00	27.25
Gray forge, Pittsburgh...	43.40	43.40	42.40	27.15
L. S. charcoal, Chicago...	57.50	57.50	57.50	38.85

Rails, Billets, Etc.,

Per Gross Ton:	June 1, 1920	May 25, 1920	May 4, 1920	June 3, 1919
Bess. rails, heavy, at mill...	\$55.00	\$55.00	\$55.00	\$45.00
O.-h. rails, heavy, at mill...	57.00	57.00	57.00	47.00
Bess. billets, Pittsburgh...	60.00	60.00	60.00	38.50
O.-h. billets, Pittsburgh...	60.00	60.00	60.00	38.50
O.-h. sheet bars, P'gh...	80.00	80.00	80.00	42.00
Forging billets, base, P'gh...	80.00	80.00	80.00	51.00
O.-h. billets, Philadelphia...	64.10	64.10	64.10	42.50
Wire rods, Pittsburgh...	75.00	75.00	70.00	52.00

Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia...	4.25	4.25	4.25	2.595
Iron bars, Pittsburgh...	4.25	4.25	4.25	2.35
Iron bars, Chicago...	3.75	3.75	3.75	2.50
Steel bars, Pittsburgh...	3.50	3.50	3.75	2.35
Steel bars, New York...	4.02	4.02	4.02	2.62
Tank plates, Pittsburgh...	3.75	3.75	3.75	2.65
Tank plates, New York...	4.02	4.02	4.02	2.92
Beams, etc., Pittsburgh...	3.10	3.10	3.10	2.45
Beams, etc., New York...	3.27	3.27	3.27	2.72
Skelp, grooved steel, P'gh...	2.75	2.75	2.75	2.45
Skelp, sheared steel, P'gh...	3.00	3.00	3.00	2.65
Steel hoops, Pittsburgh...	5.00	5.00	5.00	3.05

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.
†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75.

Per Lb. to Large Buyers:	June 1, 1920	May 25, 1920	May 4, 1920	June 3, 1919
Sheets, black, No. 28, P'gh...	5.50	5.50	5.50	4.35
Sheets, galv., No. 28, P'gh...	7.00	7.00	7.00	5.70
Sheets, blue an'd, 9 & 10...	4.50	4.50	4.50	3.55
Wire nails, Pittsburgh...	4.00	4.00	4.00	3.25
Plain wire, Pittsburgh...	3.50	3.50	3.50	3.00
Barbed wire, galv., P'gh...	4.45	4.45	4.45	4.10
Tin plate, 100-lb. box, P'gh...	\$7.00	\$7.00	\$7.00	\$7.00

Old Material, Per Gross Ton:

Carwheels, Chicago...	\$36.00	\$37.00	\$37.00	\$20.50
Carwheels, Philadelphia...	38.00	40.00	40.00	20.00
Heavy steel scrap, P'gh...	25.00	25.00	25.00	16.00
Heavy steel scrap, Phila...	22.50	23.00	24.00	15.50
Heavy steel scrap, Ch'go...	22.50	22.50	23.00	15.50
No. 1 cast, Pittsburgh...	32.00	32.00	32.00	17.00
No. 1 cast, Philadelphia...	37.00	37.00	38.00	22.00
No. 1 cast, Ch'go (net ton)	36.50	36.50	37.50	19.50
No. 1 RR. wrot, Phila...	33.00	33.00	34.00	21.00
No. 1 RR. wrot, Ch'go (net)	25.50	25.50	26.50	15.75

Coke, Connellsville,

Per Net Ton at Oven:

Furnace coke, prompt...	\$14.00	\$14.00	\$11.00	\$4.00
Furnace coke, future...	14.00	14.00	11.00	4.00
Foundry coke, prompt...	15.00	15.00	12.00	4.50
Foundry coke, future...	15.00	15.00	12.00	5.00

Metals,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York...	19.00	19.00	19.25	16.75
Electrolytic copper, N. Y.	19.00	19.00	19.25	16.50
Zinc, St. Louis...	7.70	7.60	7.95	6.15
Zinc, New York...	8.05	7.95	8.30	6.50
Lead, St. Louis...	8.15	8.15	8.40	4.95
Lead, New York...	8.50	8.50	8.75	5.20
Tin, New York...	51.50	51.00	60.25	72.50
Antimony (Asiatic), N. Y.	9.00	9.25	11.00	8.37 1/2

The above prices are for domestic delivery and do not necessarily apply to export business.

more & Ohio railroads are also a good deal better. Reports here are that the situation at Buffalo is very much better than at any time since the strike started. The greatest trouble now, and has been for some time, is the acute shortage in supply of empty cars, both open and box cars. The railroads are doing all in their power to relieve this shortage, but so far with little success. On Monday, May 31, the Pennsylvania Railroad, in the central region, moved 53,365 carloads of freight, against a movement, under normal conditions, of about 65,000 cars. In the last few days, there have been serious breaks in the ranks of the strikers, many roadmen and switchmen having returned to work, and others will do so this week. It now looks as though local railroad conditions may be back pretty close to normal inside of two weeks, but it will require a very much longer time, estimated at two to three months, to clear up the congestion of freight caused by the strike.

There has been a decided falling off in the demand for practically all kinds of finished iron and steel, with the possible exception of tin plate and tubular goods. Whether this is due to buyers getting discouraged over slow delivery of their orders placed some time ago with the mills, on which delivery is most unsatisfactory, or whether it is due to a more conservative attitude as regards the future, is undetermined. Producers say they are not alarmed over the falling off in demand, as obligations now on their books will carry them pretty well over the next three or four months. Prices remain fairly steady, but show no signs of going higher.

Pig Iron.—W. P. Snyder & Co. report the average price on Bessemer iron in May, based on sales of 1000 tons or more, to have been \$42.603 and on basic \$43.485 at Valley furnace. On Bessemer, this

shows an advance over the April price of 28.6c. and on basic 67c. The demand for pig iron is only fair, some inquiry for small lots of Bessemer and basic being in the market for prompt shipment. There are inquiries here for over 20,000 tons of basic iron for eastern shipment, but nothing has been done on them. We note a sale of 500 tons of Bessemer at \$43 and about 1000 tons of basic at \$43.50, both at Valley furnace.

We quote Valley furnace, the freight rate for delivery to the Cleveland or Pittsburgh districts being \$1.40 per gross ton:

Basic	\$43.50
Bessemer	43.00
Gray forge	42.00
No. 2 foundry	45.00
No. 3 foundry	43.50
Malleable	44.00

Billets and Sheet Bars.—The inquiry for billets and sheet bars has quieted down a good deal and prices are easier. The generally accepted price of the independent steel mills of soft Bessemer and open-hearth billets is about \$60, Bessemer sheet bars \$65 to \$70, and open-hearth sheet bars about \$75 at mill. The output of ingots in the Pittsburgh district is steadily increasing, and shipments are larger, due to the better railroad situation. In the Youngstown Ohio district, conditions are not so good, and the Bessemer and open-hearth steel plants there are operating at only about 50 per cent of capacity. The open-hearth steel plant of the Sharon Steel Hoop Co., Sharon, Pa., which was down for some weeks on account of the railroad strike, is again in operation.

We quote 4 x 4-in. soft Bessemer and open-hearth billets at \$38 to \$60; 2 x 2-in. billets, \$42; Bessemer sheet bars, \$42 to \$65; open-hearth sheet bars, \$42 to \$75, and forging billets, ordinary carbons, \$85 base, all f.o.b. Youngstown or Pittsburgh mill.

Ferroalloys.—There is a fair movement in domestic ferromanganese for prompt shipment, and we note several sales made in the past week in lots ranging from 50 to 200 tons at about \$250 per gross ton delivered. The demand for silvery iron has been active recently, and some consumers have covered their needs for last half of the year.

We quote 76 to 80 per cent domestic ferromanganese \$200 for last half delivery and \$250 for prompt delivery, with a reduction of \$1.50 to \$1.75 per unit for lower percentages. We quote 50 per cent ferrosilicon at \$80 to \$85 and 18 to 22 per cent spiegeleisen at \$70 to \$75, furnace. Prices on Bessemer ferrosilicon are: 9 per cent, \$56.50; 10 per cent, \$59.50; 11 per cent, \$62.50; 12 per cent, \$66.10. We quote 6 per cent silvery iron, \$48.25 to \$48.75; 7 per cent, \$52.50 to \$53; 8 per cent, \$54.50 to \$55; 9 per cent, \$56.50 to \$57, and 10 per cent, \$59 to \$59.50. An advance of \$3.30 per gross ton is charged for each 1 per cent silicon for 11 per cent and over on Bessemer ferrosilicon, and an advance of \$2.50 per gross ton is charged for each 1 per cent silicon for 11 per cent and over on silvery iron. All the above prices are f.o.b. maker's furnace, Jackson or New Straitsville, Ohio, which has a uniform freight rate of \$2.90 per gross ton for delivery in the Pittsburgh district.

Structural Material.—Inquiry in the past week is a little better and some work has been placed. The Jones & Laughlin Steel Co. has taken 200 tons for new steel building for the Ohio Insulator Co., Barberton, Ohio, 150 tons for an addition to the boiler house of the American Rolling Mill Co., Middletown, Ohio; the McClintic-Marshall Co. has taken 1800 tons for a boiler house for the Cambria Steel Co., Johnstown, Pa., the Cambria Co. to furnish the steel and 350 tons for a building for the Ideal Electric & Mfg. Co., Mansfield, Ohio. The Carnegie Steel Co. continues to quote 2.45c. for plain material, the Jones & Laughlin Steel Co. 3.10c. to 3.50c., depending on the buyer, while the Cambria Steel Co. still quotes plain material at about 4c. Pittsburgh.

Plates.—Some orders for cars have come out recently, and it is said inquiry is a little better. The Gulf Smokeless Coal Co. has placed 400 ore cars with the Pressed Steel Car Co., and the Havana Central Railroad has placed 300 flat and 75 ballast cars with the Standard Steel Car Co. The Pennsylvania Tank Car Co. has taken a contract for 200 tank cars and the Bessemer & Lake Erie Railroad has an inquiry out for 500 steel hoppers. The general demand for plates is not nearly so active as some time ago, and some of the independent plate mills are now in position to take on orders and make definite promise of delivery in two to three months.

We quote sheared plates of tank quality, $\frac{1}{4}$ -in. and heavier, at 2.65c. to 3c. for very indefinite delivery, while prices on $\frac{1}{4}$ -in. and heavier plates, named by mills that will agree to ship out in three to four months, is 3.50c.

Sheets.—The improvement in the railroad situation is reflected in the larger operation of sheet mills of the American Sheet & Tin Plate Co., which is now running close to 85 per cent of normal hot sheet mill capacity, and also among the independent sheet mills, which are running to between 65 and 70 per cent of capacity. As yet, conditions among the large sheet mills in the Youngstown, Warren and other points in the Mahoning Valley are not very much better, but are steadily improving. The demand for automobile and electric sheets is still very heavy. Mills are sold up to practically the end of this year and are very much back in shipments. A very large production in sheets has been lost by the railroad strike. Independent mills are quoting prices closer to those of the leading interest than for some time.

We quote No. 28 gage box annealed one-pass black sheets at 4.35c. to 6.50c.; No. 28 galvanized, 5.70c. to 8.50c., and Nos. 9 and 10 blue annealed at 3.55c. to 6c., the lower prices named being the March 21 schedules, which are still named by the leading interests, while the higher prices represent a fair range of quotations by the independent mills.

Tin Plate.—The Interstate Commerce Commission has placed tin plate on the priority list. Orders have also been issued by the Car Service Section of the American Railways Association that cars must be furnished to the tin plate mills, and that shipments must go forward as promptly as possible to the can makers. This will likely afford some relief to the tin plate situation and allow better deliveries to consumers. The American Sheet & Tin Plate Co. and nearly all other leading makers slightly reduced their heavy stocks of tin plate last week, the supply of empty cars having been a little better. The American Sheet & Tin Plate Co. is operating this week to between 55 and 60 per cent

and expects to increase its shipments steadily. While most consumers of tin plate have covered their needs for this year, some have not yet done so, and several local mills report they are receiving inquiries for tin plate from consumers to whom heretofore they have not sold, this indicating that regular sources of supply for these consumers may not be able to take care of them. Contracts for considerable quantities of tin plate for last half delivery have been made by consumers, other than can makers, at \$8 and \$8.50 per base box, at mill.

We now quote tin plate to domestic consumers for remainder of the year delivery at \$7 to \$8.50 base box, stock items \$9, and for export \$11 to \$12 per base box, all f.o.b. Pittsburgh.

Steel Rails.—Inquiry for light rails is reported fairly active, most of the new business going to the rerolling mills, as the mills that roll light rails and billets are pretty well filled up for the remainder of this year. Very little is being done in standard section, and Carnegie Steel Co. and Cambria Steel Co. are sold out on standard sections for this year.

The Carnegie Steel Co. is still quoting the March 21, 1919, prices, these being 2.45c. for 25 to 45-lb. sections, 2.49 $\frac{1}{2}$ c. for 16-lb. and 20-lb. sections, 2.54c. for 12-lb. and 14-lb. sections, and 2.58 $\frac{1}{2}$ c. for 8-lb. and 10-lb. sections. This company is also quoting standard sections 50 lb. and heavier at \$45 for Bessemer and \$47 for open hearth stock. The Cambria Steel Co. is quoting 25-lb. to 45-lb. sections at 3.75c., 16-lb. and 20-lb. sections, 3.79 $\frac{1}{2}$ c., and 12-lb., 3.84c. at mill, for such delivery as it can make.

Wire Rods.—Local makers say they have no trouble whatsoever in getting \$75 per gross ton at mill for all the soft Bessemer or open-hearth rods they care to sell, the demand being very urgent. Several local makers have sold soft rods recently to manufacturing consumers at this price. One maker has 25,000 tons or more of rods piled up waiting for cars in which to move them. We quote soft Bessemer and open-hearth rods at \$75, screw stock rods \$80 to \$85, and high carbon rods \$85 to \$100, at mill.

Wire Products.—The demand for wire nails and also for plain annealed wire for manufacturing purposes is still reported by the mills to be heavy, and the available supply is very limited, a large production having been lost by the railroad strike. Local mills are selling in a limited way to regular customers only, at \$4 base, for wire nails, extras as per the new card, and plain wire \$3.50 per 100 lb. Cement-coated nails are held firm by the independent mills at \$3.60 base. The American Steel & Wire Co. is still quoting the March 21 prices of last year, which are \$3.25 base for wire nails and \$3 base for plain wire. Prices on wire products are given in detail on page 1629.

We quote wire nails at \$3.25 base, this being the price of the American Steel & Wire Co., and \$4 base on the new card recently issued by four or five of the independent mills. We quote bright basic wire at \$3, this being the price of the American Steel & Wire Co., and \$3.50, this being the price of most of the independent mills.

Iron and Steel Bars.—The output of iron and steel bars since the railroad strike started is estimated to have been not over 50 per cent of normal, but as the railroad situation is a good deal better, the output of bars is showing some increase. Buying is not very heavy, as most consumers are pretty well covered over the remainder of this year, but shipments are slow.

We quote steel bars rolled from billets at 2.35c., this being the price of the Carnegie Steel Co. for very indefinite delivery, likely not before first quarter of next year. Other mills rolling steel bars from billets quote from 3c. to 3.50c. at mill, prices depending entirely on the buyer and the delivery wanted. The demand for concrete reinforcing steel bars is fairly active, and we quote these, when rolled from billets, at 4c. to 4.25c., and from old steel rails at about 3.50c. at mill. We quote common iron bars at 4.25c. to 4.50c. and refined iron bars at 4.50c. to 5c. in carloads, f.o.b. mill, Pittsburgh.

Cold-Rolled Steel Bars.—Local makers say they do not yet see any material falling off in the demand for cold-rolled steel bars, which from the automobile builders is still very heavy. Delivery by truck is still going on, one local maker having recently made delivery of cold-rolled steel bars by truck as far as Knoxville, Tenn., and Hartford, Conn. Shipments by truck to leading automobile centers are getting common and it is probable that even after the railroad strike is settled, delivery to many points not too far away will still be made. The time saved is the main factor in truck delivery and it is very considerable. Prices are firm and we

continue to quote cold-rolled steel bars at 4.10c. to 4.25c. per lb. to regular customers, f.o.b. at mill. Some premium prices still obtain and these range from 5c. to 7c. at mill, for small lots. One local maker reports that its minimum price in large lots to regular customers is 4.25c. per hundred pounds.

Hot-Rolled Strip Steel.—The demand is still fairly active but not as heavy as some time ago. Local makers of hot-rolled strips are holding firm at 5½c. per lb. at mill, to regular customers. Premium prices are displayed to some extent and these still range from 5c. to 7c. per lb. at mill, for small lots.

Cold-Rolled Strip Steel.—Delivery by truck is still going on, and hauls of anywhere from 50 to 500 miles or more are getting quite common. Local makers are holding firm at 8½c. per lb. at mill, to regular customers. Premium prices from 9c. to 10c. per lb. are still being quoted in some cases.

Nuts, Bolts and Rivets.—Several local makers say that receiving and shipping conditions are growing better daily, but are still far short of being satisfactory. Several large plants making nuts and bolts are located on the Allegheny River, North Side, and have been receiving shipments of steel bars by barge from the Duquesne Steel Works and the Carnegie Steel Co. There is a great deal of inconvenience in handling these bars, but it is better than not getting any shipments. Local makers have not made any advance in prices for a considerable time and say that within the next week or ten days they will start to sell their manufacturing customers for third quarter delivery at present prices. The demand for nuts, bolts and rivets has fallen off very considerably recently, but the makers still have enough orders on their books to take their present restricted output over the next three or four months. Prices on rivets and discounts on nuts and bolts, in carload and larger lots, are given on page 1629.

Spikes.—The largest inquiry for standard railroad spikes that has come into this market for some time is one from the Atlantic Coast Line for 500 kegs, and, if placed, will likely go to a local maker. The demand for spikes of all grades for some time has been mostly for small lots, and local makers say they have plenty of orders to take care of their entire output for the next four months.

We quote standard spikes, ¾ to 9/16 in. and larger, \$4 base per 100 lb. in carload lots of 200 kegs of 200 lb. each, and small spikes, ¾ in. and 7/16 in., \$4.50; 5/16 in., \$5; boat and barge spikes, \$4.25 f.o.b. Pittsburgh. Tie plates, \$3 to \$4 per 100 lb.

Chain.—The American Chain Co. and the U. S. Chain & Forging Co. are still quoting the base price of 6.35c. on steel chain. The U. S. Chain & Forging Co. has issued a new card on which the extras on conveyor, railroad switch and brake chains have been increased about \$5 per ton. The demand for chain is reported as fairly active and local makers say shipments are better now than at any time since the railroad strike started.

Hoops and Bands.—The demand is fairly active and local makers are pretty well filled up into third quarter. The Carnegie Steel Co. is still quoting 3.05c. for hoops and bands, usual extras, and two other local makers are quoting 5c. to 5½c. at mill, on both hoops and bands.

Cotton Ties.—No price has yet been named on cotton ties for this season's trade. The concerns that make cotton ties are holding prices back until they can get a clearer line on the probable size of the cotton crop this year, in order that they can more accurately arrange the ruling schedule.

Boiler Tubes.—The demand for stationary tubes and for seamless tubes is heavy, and for locomotive tubes is also reported to be getting larger. Local makers of both iron and steel tubes say they have about all the orders on their books that they can take care of this year, and one of the leading makers of seamless steel tubes is pretty well filled up into the first quarter of next year.

Iron and Steel Pipe.—The demand for tubular goods of all kinds is still heavy, but is not so urgent as some time ago. There is still a number of oil and gas lines that would no doubt be placed with the mills if they

were in a position to make deliveries wanted, which they are not. In May the output of the National Tube Co. was one of the largest in any one month in its history, and its shipments of material during the month, in spite of the railroad strike, were about 80 per cent of the output. The Jones & Laughlin Steel Co. also had a large output and sent out a good many train loads of pipe from its mills at Woodlawn, Pa. In the Youngstown and Wheeling districts, operating conditions are getting better. Discounts on iron and steel pipe are given on page 1629.

Coke.—Shipping conditions in the coke trade are getting better and output is also larger. Some blast furnaces in the valleys, also in the Pittsburgh district, are receiving better shipments of coke and have started up. Asking prices for standard grades of Connellsville furnace coke range from \$14 to \$16 at oven, and some sales have been made at these prices. The output of coke in the upper and lower Connellsville region last week was 178,250 tons, an increase over the previous week of nearly 24,000 tons. We quote standard grades blast furnace coke for prompt delivery at \$14 to \$15 and 72-hr. foundry coke at \$15 to \$16 per net ton at oven.

Scrap.—More scrap is moving to consumers' mills in this district than at any time since the railroad strike started. There is also some interest being displayed in the market and consumers and dealers look for a buying movement to start in the near future. The scrap list of the Pennsylvania Railroad has been issued and is heavy. The leading items it contains are: 580 tons frogs and switches; 640 tons couplers and knuckles; 900 tons 50-lb. rail; 1700 tons heavy melting scrap; 1300 tons borings and turnings; 800 tons railroad wrought scrap and about 900 tons destroyed steel cars. Awards on this list are to be made on June 5. A sale of 300 tons heavy melting scrap has been made at \$25 and 200 tons of turnings at about \$15 delivered to consumers mills.

We quote for delivery to consumers' mills in the Pittsburgh and other districts that take Pittsburgh freight rates, as follows:

Heavy melting steel, Steubenville, Follansbee, Brackenridge, Monessen, Midland and Pittsburgh, delivered	\$25.00 to \$25.50
No. 1 cast for steel plants	34.00 to 35.00
Rerolling rails, Newark and Cambridge, Ohio; Cumberland, Md.; Franklin, Pa., and Pittsburgh	32.00 to 33.00
Compressed steel	22.00 to 22.50
Bundled, sheet hides and ends, f.o.b. consumers' mills Pittsburgh dist. ..	16.00 to 16.50
Bundled, sheet stamping	15.00 to 15.50
No. 1 busheling	17.50 to 18.00
Railroad grate bars	26.00 to 26.50
Low phos. melting stock (bloom and billet ends, heavy plates) ¾ in. and heavier	30.00 to 30.50
Railroad malleable	30.00 to 30.50
Iron car axles	37.00 to 38.00
Locomotive axles, steel	34.00 to 35.00
Steel car axles	31.00 to 32.00
Cast iron wheels	40.00 to 41.00
Rolled steel wheels	29.00 to 30.00
Machine-shop turnings	15.00 to 15.50
Sheet bar crop ends (at origin)	28.00 to 28.50
Heavy steel axle turnings	29.00 to 30.00
Heavy breakable cast	32.00 to 32.50
Cast iron borings	17.00 to 17.50
No. 1 railroad wrought	31.00 to 32.00

Plant Permanently Closed

As a result of the strike of union molders of the several foundries of Chambersburg, Pa., the recently opened Chambersburg Foundry Co., owned and operated by Philadelphia interests, has announced its intention to close its plant permanently. Plans are being made to remove some of the machinery, while Chambersburg people are attempting to persuade officials to reconsider their decision.

The Interstate Iron & Steel Co., Chicago, has let a contract to the Great Lakes Dredge & Dock Co. for the construction of a warehouse 100 x 900 ft., at its works on the Calumet River at One Hundred Eighteenth Street. The building will cost \$312,000.

The Standard Supply & Equipment Co., Philadelphia, has bought the E. S. Stacy Supply Co., Springfield, Mass., and the Stacy Supply Co., Hartford, Conn. Previously the Moore Drop Forging Co. owned the controlling interest in these two companies.

New York

NEW YORK, June 1.

Pig Iron.—The transportation situation improves slowly. Permits to move pig iron are being more freely issued by railroads and some important shipments, including a train of 45 cars from Virginia to New England, have been made. Arrangements are also being made for the shipment of pig iron in the Buffalo district to Brooklyn and other points by boat and railroad. Up to the present time, grain shipments have had the preference and it is expected that there will now be a considerable movement of pig iron by water. Moderate selling has continued and prices recently quoted are firmly adhered to. In one firm's sales of 5000 to 6000 tons last week was included about 3000 tons for export. It could have sold more for export if the iron had been obtainable. Foundries are as insistent as ever on deliveries. There is no hint anywhere of cancellation of orders or contracts. Foundries continue to operate under many difficulties, owing to the slow movement of pig iron and coke. The fact that jobbing foundries are extremely busy is regarded as an important point at the present time, because it indicates general activity of users of castings.

We quote for delivery in New York as follows:

East. Pa., No. 1 fdy., sil. 2.75 to 3.25.	\$50.05 to \$51.05
East. Pa., No. 2X fdy., sil. 2.25 to 2.75.	49.05 to 50.05
East. Pa., No. 2 fdy., sil. 1.75 to 2.25.	47.80 to 48.80
Buffalo, sil. 1.75 to 2.25.	47.90 to 48.90
No. 2 X Virginia, sil. 2.25 to 2.75.	49.60

Ferrolloys.—The ferromanganese market continues very quiet but strong at \$225 to \$250 for British or domestic alloy for June delivery, with \$200, delivered, asked for domestic alloy for the last half. A limited amount of British alloy for shipment in the last half is again available at \$195, seaboard, as well as a small amount for delivery before July 1 at \$225, seaboard. There have been sales of a few lots of domestic alloy for June delivery at \$250, delivered. For the last half demand is light and no transactions have been recorded. The Southern Manganese Corporation, Anniston, Ala., is now operating one electric furnace on ferromanganese and will start another this month. The Tennessee Manganese Co., Cleveland, Tenn., is producing electric ferromanganese on a small scale and also a company in Colorado is making this alloy in an electric furnace. The spiegeleisen market is strong at \$75, furnace, for the higher grade, 18 to 22 per cent. Sales are reported for about 2000 tons for domestic consumption at around this figure. The demand for export is exceedingly good. The 50 per cent ferro-silicon market is unchanged and more or less nominal at \$80 to \$90, delivered, with the needs of most consumers provided for for the present. Quotations for the last half are not yet made public. Quotations for ferrotungsten or tungsten powder are 85c. to \$1.15 per lb. of contained tungsten. Ferrovandium is quoted at \$6.50 to \$7 per lb. of contained vanadium in wholesale lots for early delivery, but these are nominal, the alloy being exceedingly scarce. Small lots for prompt delivery are selling above \$7. Ferrocobaltititanium, 15 to 18 per cent, is selling at \$200 per net ton in carload lots, at \$220 per ton in lots between one ton and a carload, and at \$250 per ton in lots less than a ton, f.o.b. Suspension Bridge, N. Y.

Finished Iron and Steel.—A marking of time best describes the situation. New buying is not of large volume, and is of an emergency character. Deferred deliveries at the low price levels are no incentive, while the better deliveries, even though higher prices are then commanded, are secondary to the actual uncertainty not merely of promises being met, but of the securing of labor to utilize the material. Better freight movements are commonly admitted, and some inroads have been made on mill accumulations, but an expansion of operations awaits an increase of the store of fuel and other raw materials. A wide divergence in quotations still obtains, but in plates and shapes a diminishing volume now moves at as high as 4c., Pittsburgh. Steel bars remain strong, and the sale of 150 tons to no particular chemical or physical specifications is noted for the fourth quarter and into next year at above 4c. at mill. A fair run of structural steel awards has been made, but

new projects are not many and nothing tangible has yet developed in respect to railroad car buying, even orders for 1000 cars for the Chesapeake & Ohio being tentative. On six piers for New York, at Stapleton, Staten Island, involving 15,500 tons, Post & McCord were low bidders on two requiring 7400 tons, McHarg Barton Co. on two requiring 2000 tons, and the Snare & Triest Co. was low on the remaining two. Post & McCord have been awarded 9000 tons for the United Electric Light & Power Co.'s plant at Hell Gate. Awards also include 2500 tons for the Ritz Carlton hotel, Atlantic City, to the Bethlehem Steel Bridge Corporation; 400 tons for the Cammeyer Co. on Fifth avenue to Hay Foundry & Iron Works; and the following to the American Bridge Co.: 250 tons for the General Electric Co. at Fort Wayne, 200 tons for the Baltimore & Ohio and 200 tons for the Aluminum Ware Mfg. Co., Elmira, N. Y. A schoolhouse at Hartford taking 575 tons is up for figures. A 600-ton bridge at East Chester Creek exceeded available funds. A wireless station is to be built by the Radio Corporation at Rocky Point, L. I., by the J. G. White Engineering Corporation, New York, having 12 sets of antennae, strung to 72 self-supporting steel towers 400 ft. high, set up 1½ miles around the central power house for communication with Argentine, France, Scandinavia, Germany, Italy and Poland.

We quote for mill shipment, New York, as follows: Soft steel bars, 2.62c. to 4.52c.; shapes, 2.72c. to 4.27c.; plates, 2.92c. to 4.27c., the minimum prices being for indefinite delivery and the highest prices for delivery in a few weeks; bar iron, flats, wider than 6 in., 4.57c.; ¾ and 7/16 in., round and square, 5.27c.; light rounds, squares and flats, 5.77c., and other sizes, 4.27c.

High Speed Steel.—Prices show a slight tendency to stiffen, but continue at \$1.25 to \$1.30 per lb., New York. Shortage and high prices of vanadium and tungsten in England are having their effect on the price of the British product.

Cast Iron Pipe.—Business is steady and prices remain firm. We quote 6-in. and heavier at \$76.30, New York; 4-in. \$79.30, with \$2 additional for Class A and gas pipe.

Warehouse Business.—Transportation shows a noticeable improvement. To facilitate deliveries solid trains are sent out by the mills whenever possible and warehouses in order to obtain material transport it short distances by motor truck. Shortage of sheets and wire products is still acute with inquiries from consumers numerous. Warehouses report an increasing easiness in obtaining shipment from stocks at mills. Prices are to a large extent unchanged. We quote prices on page 1646.

Old Material.—Prices are still receding and we have marked about 10 items lower, including heavy melting steel. Brokers and dealers are not expecting much business with the summer months approaching, when even in normal times full manufacturing capacity is not maintained. Accordingly, higher prices are not looked for. The car situation as regards scrap shipments is a trifle better, but this does not greatly affect the situation because of absence of demand. The greatest fall in price this week is in old car wheels which are marked off \$2.

Buying prices per gross ton, New York, follow:

Heavy melting steel.....	\$19.00 to \$1950
Rerolling rails	29.00 to 30.00
Relaying rails, nominal.....	52.00 to 54.00
Steel car axles.....	37.00 to 38.00
Iron car axles.....	42.00 to 43.00
No. 1 railroad wrought.....	30.00 to 31.00
Wrought iron track.....	22.00 to 22.50
Forge fire	14.50 to 15.00
No. 1 yard wrought, long.....	23.50 to 24.00
Light iron	9.00 to 10.00
Cast borings (clean).....	16.50 to 17.00
Machine-shop turnings.....	15.00 to 15.50
Mixed borings and turnings.....	14.50 to 15.00
Iron and steel pipe (1 in. min. diam., not under 2 ft. long).....	19.50 to 20.00
Stove plate	26.50 to 27.00
Locomotive grate bars.....	28.00 to 28.50
Malleable cast (railroad).....	29.00 to 30.00
Old car wheels.....	35.00 to 37.00

Prices which dealers in New York and Brooklyn are quoting to local foundries, per gross ton:

No. 1 machinery cast.....	\$39.00 to \$40.00
No. 1 heavy cast (columns, building materials, etc.), cupola size.....	38.00 to 39.00
No. 1 heavy cast, not cupola size.....	32.00 to 33.00
No. 2 cast (radiators, cast boilers, etc.)	31.00 to 32.00

Boston

BOSTON, June 1.

Pig Iron.—The market has continued quiet the past week, total new business booked not being much in excess of 2000 tons. Sellers' efforts still are mainly directed to getting iron on contract from the furnace to the foundry. Some New England melters have closed temporarily for lack of iron; others manage to keep going and that is all, but the supply situation as a whole is better than it was last week and should improve further, inasmuch as the Boston & Albany Railroad lifted its embargo midnight, May 28. Permits for N. Y., N. H. & H. R. R. routings are accessible. Approximately half of the iron sold since last reports was Southern, including 250 tons silicon 2.75 to 3.25, high phosphorus, prompt shipment, to Boston interests at \$45.40, furnace, and 100 tons of same iron and same price to a Waterbury, Conn., consumer; also 150 tons silicon 2.75 to 3.25, low manganese, to a Wakefield, Mass., consumer at \$43.75, furnace, and 200 tons silicon 2.25 to 2.75, regular analysis, prompt shipment, to a Taunton, Mass., consumer at \$43.75, furnace. Other sales include 300 tons Virginia, silicon 2.75 to 3.25, spot shipment, at \$48, furnace, one lot of 400 tons eastern Pennsylvania No. 2 X, last half, and 100 tons in another lot at \$45, furnace base. A railroad equipment manufacturer bought 100 tons eastern Pennsylvania malleable, prompt shipment, at \$46, furnace. One New England charcoal iron maker, closed for lack of fuel, is expected to resume operations at an early date. One foundry with Pennsylvania iron bought for July delivery and another with Virginia iron bought for August delivery, have asked furnaces to anticipate shipments, the total tonnage involved being about 500 tons. Delivered pig iron prices follow:

East. Penn., sil. 2.25 to 2.75.....	\$49.15 to \$51.15
East. Penn., sil. 1.75 to 2.25.....	47.90 to 49.90
Cent. & West. Penn., sil. 2.25 to 2.75.....	49.95 to 50.95
Cent. & West. Penn., sil. 1.75 to 2.25.....	48.70 to 49.70
Buffalo, sil. 2.25 to 2.75.....	49.15 to 50.15
Buffalo, sil. 1.75 to 2.25.....	47.90 to 48.90
Virginia, sil. 2.25 to 2.75.....	49.95 to 50.95
Virginia, sil. 1.75 to 2.25.....	48.70 to 49.70
*Alabama, sil. 2.25 to 2.75.....	49.45
*Alabama, sil. 1.75 to 2.25.....	47.75

*Alongside Boston prices.

Finished Material.—Some mills have succeeded in getting solid trains of finished material into New England, and others hope to within the near future. All other shipments are subject to special permits, which are easier to obtain. Another week should see a further improvement in the railroad transportation situation. Mill representatives continue to accept new business with reservations and then only from regular customers. One eastern Pennsylvania mill has accepted a small tonnage of steel bars at 4.75c., mill, nearby shipment. A Pittsburgh mill is offered 3.75c. mill for a round tonnage of heavy steel bars, but has not accepted the order. Most mills are not in the market for bar business. One mill is accepting new universal plate business at 3.75c., mill; another at 4c. The general asking price on sheared plates is 3.50c., mill, when business actually is booked. One mill has established all previously unpriced, unfilled tonnage of blue annealed sheets at \$5.50 base, Pittsburgh, black sheets at \$6.50 base and galvanized sheets at \$7.75 base, having discontinued the practice of issuing monthly lists. Structural prices range from 2.45c. to 4c., in some cases f.o.b. works and in others f.o.b. Pittsburgh. The A. L. Smith Iron Works, Chelsea, Mass., is awarded 141 tons miscellaneous structural for the new Thayer-Griffith & Co., Boston, trucking establishment, and the McClintic-Marshall Co. about 100 tons for a Lowell, Mass., hotel. Stone & Webster will soon award about 400 tons for the Manhattan Rubber Co., Hanover, N. J., plant. Bids will be asked about July 1 for the new \$5,000,000 Providence, R. I., hotel.

Warehouse Business.—A majority of warehouse dealers are still quoting iron and steel on the recently established basis of 6c. per lb. Some houses, however, are quoting on the old 5.50c. per lb. basis, which gives the market an irregular appearance. Those houses quoting 6c. are better supplied with iron and steel, es-

pecially the latter, than those asking 5.50c., consequently a very large share of going business is at the higher price and the real market, therefore, is on that basis. Mill shipments have been received since last reports, but not frequently enough to relieve the scarcity of stock. Cold-rolled steel continued in urgent demand and light supply.

Jobbers quote: Soft steel bars, \$6 to \$6.50 base per 100 lb.; flats, \$6.50 to \$6.85; concrete bars, \$6 to \$6.50; tire steel, \$7 to \$7.50; spring steel, open hearth, \$11; crucible, \$16; steel bands, \$8 to \$8.25; steel hoops, \$9; toe calk steel, \$8; cold rolled steel, \$10 to \$10.50; structural, \$6 to \$6.50; plates, \$6.50; No. 10 blue annealed sheets, \$9; No. 28 black sheets, \$9.15; No. 28 galvanized sheets, \$10.50; refined iron, \$6 to \$8 base; best refined, \$7.50; Wayne, \$8.50; band iron, \$8; hoop iron, \$9; Norway iron, \$20.

Old Material.—Local scrap dealers are getting cancellations on orders placed by mills for old material, as well as rejections from mills and New England foundries. These cancellations and rejections coupled with almost no demand, a scarcity of empty freight cars and men to load scrap on cars when the latter are secured have made for generally lower prices. Prices in some instances are purely nominal because no actual transactions have been made. Railroad wrought is a case in point. Most dealers quote \$27 to \$28, but say it is doubtful if they could get better than \$24 or \$25. However, as no sales have been made, the market must be nominally \$27 to \$28. The Boston & Maine Railroad sold about 30 cars of miscellaneous scrap during the past week at prices under those quoted by dealers a week ago. The Navy Department sold about 500 tons of old material located at Portsmouth, N. H., including 200 tons chargeable shaped steel at \$22.40 f.o.b. Portsmouth, presumably for export. Yard prices on old material follow:

No. 1 railroad wrought.....	27.00 to 28.00
No. 1 yard wrought.....	24.00 to 25.00
Wrought pipe (1 in. in diameter, over 2 ft. long).....	18.50 to 19.50
Machine shop turnings.....	14.00 to 15.00
Cast iron borings.....	15.50 to 16.00
Heavy axle turnings.....	15.50 to 16.50
Blast furnace borings and turnings.....	14.00 to 14.50
Forged scrap.....	14.50 to 15.00
Bundled skeleton.....	14.50 to 15.00
Street car axles.....	31.00 to 32.00
Car wheels.....	37.00 to 38.00
Machinery cast.....	35.00 to 40.00
No. 2 cast.....	35.00 to 36.00
Stove plate.....	26.00 to 27.00
Railroad malleable.....	26.00 to 27.00
Rerolling rails.....	27.50 to 28.50

Buffalo

BUFFALO, June 1.

Pig Iron.—The market during the past week has been distinguished by few interesting developments. Furnaces are strictly marking time. No effort is being made to sell a ton of iron, and such sales as are being made are of the inconsequential kind which have no real significance. The producers are forced into this attitude by the demoralization of transportation conditions. The roads are recovering but slowly from the effects of the two switchmen's strikes. Cars are few and far between; embargoes clog the free movement of shipments and supplies, and there is no incentive for sales departments to push business. Iron is being steadily piled. During the latter part of the week a slight improvement was noticeable in receipts of empties, and it is thought that the operation of the roads by the car service committee working under the Interstate Commerce Commission is having the effect of loosening the jam somewhat. Sales have been limited to a few carloads of foundry at the regular base price of \$45. The condition of the market is reflected in a low inquiry. The only exception to this was three inquiries for foundry aggregating 5000 tons, reported by one furnace.

We quote f.o.b. Buffalo:

No. 1 foundry, 2.75 to 3.25 sil.....	\$48.00
No. 2 X foundry, 2.25 to 2.75 sil.....	46.25
No. 2 plain, 1.75 to 2.25 sil.....	45.00
Basic.....	\$44.00 to 45.00
Malleable.....	46.25
Lake Superior charcoal.....	58.00 to 60.00

Finished Iron and Steel.—The demand is holding up remarkably well considering the disabled traffic conditions. No effort is being made to sell, though some orders are coming in, and where it is possible to recon-

cile these urgent requirements with the mill schedule, the tonnages are taken on. There is a continued quiet in the letting of structural jobs, though orders are being placed by fabricators for plain material in remarkable quantities. There has been little change in prices, though there seems to be a lowering of the spread by certain of the higher premium mills. Increased pressure is being brought to bear by tin plate customers, now that the canning season is approaching, and there is an acute shortage of wire products, particularly nails. There has been less piling of material than heretofore, though some mills have had to resort to it extensively. Shipment by motor truck is not held feasible in this district, as most of the plants are surrounded by a network of tracks which makes this procedure prohibitive. One large producer here states that demand on plates and shapes has eased up, but is heavy for bars, though this particular mill is out of the market on this material. It will sell plates for delivery over the next three months.

Jobbers quote the following prices for this territory: Steel bars, 4.61c.; iron bars, 5.26c.; structurals, 4.46c.; plates, 4.66c.; No. 10 blue annealed sheets, 6.51c.; No. 28 black sheets, 8.25c.; No. 28 galvanized sheets, 9.50c.; bands, 5.81c.; hoops, 6.06c.; cold rolled steel, 6.00c.

Old Material.—A review of the market this week shows that there is little or no activity. The scrap industry has been paralyzed by the traffic situation, which has not yet mended to the point where there is any freedom of trading. An occasional car of scrap is being shipped when cars are available and destination is not under embargo. But there is real difficulty in the mere switching of intra-city shipments. Fundamentally the market appears to be very sound, as evidenced by the fact that throughout this dull period prices have remained practically where they were. There has been no selling in connection with the bid of an Algoma consumer for steel at \$26, Buffalo, so far as can be learned. We quote dealers' asking prices, per gross ton f.o.b. Buffalo, as follows:

Heavy melting steel, regular grades.	\$24.00 to \$25.00
Low phos., 0.04 and under.	31.50 to 32.50
No. 1 railroad wrought.	30.50 to 31.50
No. 1 machinery cast.	37.50 to 38.50
Iron axles	39.00
Steel axles	39.00
Car wheels	37.00 to 38.00
Railroad malleable	30.50 to 31.50
Machine-shop turnings	15.00 to 16.00
Heavy axle turnings	19.50 to 20.50
Clean cast borings	16.50 to 17.50
Iron rail	29.50 to 30.50
Locomotive grate bars	23.50 to 24.50
Stove plate	31.50 to 32.50
Wrought pipe	20.50 to 21.50
No. 1 busheling	19.50 to 20.50
Bundled sheet stamping	16.50 to 17.50

Birmingham

BIRMINGHAM, ALA., June 1.

Pig Iron.—The Birmingham iron market remains strong at \$42 for the big business done by the large interests and \$43 and \$44 for some spot business. The vast bulk is done on the \$42 base with no effort to raise or lower. The market has been singularly stable since that base was thoroughly established. The export inquiry is active and several additional bookings have been made. One is for 1000 tons to move out of New Orleans, destination not stated by the export agent. This is for July or earlier. There is an inquiry from England for 20,000 tons. An order for 1500 tons for the Mediterranean for last half has also been booked the past week. New England has been booking orders with regularity, the movement to be by vessel out of Savannah. More of this business was done during the week. One of the foreign inquiries is for charcoal iron, of which the Alabama make is limited to one stack at Shelby. The new stack blown in by the Tennessee company at Ensley went on basic, making eight on basic to one on foundry. The stack going in recently at Bessemer did not go on foundry, as was first stated, but on basic. Active stacks in Alabama at close of the month were nine on basic, one on charcoal and 18 on foundry compared with 15 at this time in 1919. Pig iron is moving out of yards in fine shape, the car shortage being principally confined to gondolas for mine

use. The Tennessee company's unusual number of stacks on basic indicates the heavy steel production now going on.

We quote per gross ton, f.o.b. Birmingham district furnaces, the Tennessee company excepted, as follows:

Foundry, sil. 1.75 to 2.25	\$42.00 to \$44.00
Basic	41.00 to 43.00
Charcoal	55.00

Cast Iron Pipe.—The Birmingham Pipe & Fittings Co. and Kilby Pipe Shops, both new sanitary pipe plants, expect to be operating in July. All lines of pipe are active. The two movements of water and gas pipe to the Pacific Coast via steamer from Mobile made it in two weeks from leaving Mobile. The total cargo was 6500 tons. Prices remain at \$73 for 4 in. and \$70 for 6 in. and upwards.

Coal and Coke.—The Sloss-Sheffield Steel & Iron Co. is now operating its 120-oven Semet-Solvay by-product works in full, the second battery of 60 ovens going in during the week. Mine troubles at individual mines were not sufficient to reduce the output, that of the week ending April 22 being, in fact, 299,000 tons compared with 11,000 less the week before. Car shortage is what holds production down. The Corona Co. has announced a dollar increase owing to continuous car shortage and overhead. Coke is scarce and brings \$11 to \$12.50 for good foundry. Points as far away as Minnesota vainly seek a supply in Alabama.

Old Material.—The scrap market is still featureless, but the yard men hold much of their steel for higher prices than they receive when they make sales. Cast and stove plate are active.

We quote per gross ton, f.o.b. Birmingham district yards prices to consumers, as follows:

Steel rails	\$21.00 to \$22.00
No. 1 steel	19.00 to 20.00
Cast iron borings	14.00 to 15.00
Machine shop turnings	14.00 to 15.00
No. 1 cast	34.00 to 35.00
Car wheels	32.00 to 33.00
Tramcar wheels	31.00 to 32.00
Steel axles	29.00 to 30.00
No. 1 wrought	28.00 to 27.00

St. Louis

ST. LOUIS, June 1.

Pig Iron.—Some few sales of pig iron have been made in this district during the past week, the aggregate being probably 2500 tons on a basis of \$42 Birmingham. For the most part, however, the market has been quiet because of the shipping and other conditions which have prevailed preventing movement of either finished products or raw materials. The terminal situation is clearing up somewhat on both sides of the river and is being helped by the individual roads using their motive power for transferring across the river, leaving the terminal equipment free to make up trains. The switching forces are increasing steadily, but the breaking in of new men is still slowing up the work.

Coke.—Some shipments of coke have been coming forward from the Pennsylvania district, but not in very large volume. However, this is easing up the situation somewhat. Efforts of some sales agents to hasten matters by ordering forward full trainloads to fictitious consignees and then diverting en route is not meeting with the approval of the railroads to any extent and in some cases is resulting in delay rather than improvement of the situation. Some sales of Connellsville coke have been made at \$15 to \$16 Connellsville for prompt shipment, while \$13 is being asked for deferred shipments.

Finished Iron and Steel.—There has been no marked improvement in the receipt of finished iron and steel and the market, therefore, is showing no special feature, as representatives are tied up by the situation, while future orders are not being placed by consumers because of the delivery conditions and the general uncertainty. Movement out of warehouse is limited to materials on hand and ability to substitute, with arrivals apparently no better than they have been. For stock out of warehouse we quote as follows:

For stock out of warehouse we quote as follows: Soft steel bars, 3.94c.; iron bars, 4.50c.; structural material, 4.04c.; tank plates, 4.24c.; No. 10 blue annealed sheets, 7.09c.; No. 28 black sheets, cold rolled, one pass, 8.10c.; No. 28 galvanized sheets, black sheet gage, 9.60c.

Old Material.—The scrap market, because of the embargoes in effect and the general shipping condition, is as dead as ever, with the small dealers showing some tendency toward a willingness to soften prices, presumably because of their limited ability to hold the scrap they have on hand or under contract. The larger dealers, however, are making no concessions and are, apparently, willing to await the clearing up of the transportation situation which is slowly coming on. For lack of actual transactions, no changes in quotation are possible, and the figures given are essentially estimates of value which might easily be varied with business moving.

We quote dealers' prices f.o.b. customer's works, St. Louis industrial district, as follows:

Per Gross Ton	
Old iron rails.....	\$31.50 to \$32.00
Old steel rails, rerolling.....	30.00 to 30.50
Old steel rails, less than 3 ft.....	24.00 to 24.50
Relaying rails, standard sections, subject to inspection.....	50.00 to 55.00
Old car wheels.....	34.50 to 35.00
No. 1 railroad heavy melting steel.....	22.50 to 23.00
Heavy shoveling steel.....	21.00 to 21.50
Ordinary shoveling steel.....	20.50 to 21.00
Progs, switches and guards, cut apart.....	23.00 to 23.50
Ordinary bundled sheets.....	13.00 to 13.50
Per Net Ton	
Heavy axle and tire turnings.....	15.00 to 15.50
Iron angle bars.....	28.00 to 28.50
Steel angle bars.....	21.00 to 21.50
Iron car axles.....	39.50 to 40.00
Steel car axles.....	32.50 to 33.00
Wrought arch bars and transoms.....	31.00 to 31.50
No. 1 railroad wrought.....	25.50 to 26.00
No. 2 railroad wrought.....	23.50 to 24.00
Railroad springs.....	21.50 to 22.00
Steel couplers and knuckles.....	22.00 to 22.50
Locomotive tires, 42 in. and over, smooth inside.....	20.00 to 20.50
No. 1 dealers' forge.....	20.00 to 20.50
Cast iron borings.....	13.50 to 14.00
No. 1 busheling.....	19.50 to 20.00
No. 1 boiler, cut to sheets and rings.....	17.00 to 17.50
No. 1 railroad cast.....	35.00 to 35.50
Stove plate and light cast.....	27.00 to 27.50
Railroad malleable.....	25.00 to 25.50
Agricultural malleable.....	24.00 to 24.50
Pipes and flues.....	17.00 to 17.50
Heavy railroad sheet and tank.....	16.50 to 17.00
Railroad grate bars.....	26.00 to 26.50
Machine-shop turnings.....	12.00 to 12.50
Country mixed.....	17.50 to 18.00
Uncut railroad mixed.....	18.00 to 18.50
Horseshoes.....	24.50 to 25.00

Cincinnati

CINCINNATI, June 1.

Pig Iron.—The pig iron market is exceptionally dull, the aggregate sales during the past week falling below those of the previous week. Inquiries for foundry iron consists mostly of small lots for fill-in purposes from melters who have underestimated their requirements for the first half. No interest is being shown in last half buying. Two inquiries for basic are before the market, one of 10,000 tons from an Ohio steel maker, and one of 5000 tons from an Eastern interest. Prices remain unchanged from last week, though there is a persistent report that at least one Southern interest has disposed of some foundry iron at \$1 under the market. It is also reported that Virginia iron has been sold in this territory at \$42, base, furnace. The Southern market is firm at \$42, with a number of furnaces asking \$44 for second half, but placing little business at that figure. Southern Ohio foundry is still quoted at \$45, with Jackson County silvery \$58 for 8 per cent. One southern Ohio furnace is quoting malleable at \$48.25, but it is understood this grade can be obtained at \$45 from other furnaces.

Based on freight rates of \$3.60 from Birmingham and \$1.80 from Ironton, we quote f.o.b. Cincinnati:

Southern coke, sil. 1.75 to 2.25 (base price).....	\$45.60
Southern coke, sil. 2.25 to 2.75 (No. 2 soft).....	46.85
Ohio silvery, 3 per cent sil.....	59.80
Southern Ohio Coke, sil. 1.75 to 2.25 (No. 2).....	46.80
Basic Northern.....	41.80
Malleable.....	\$45.80 to 46.80

Coke.—The coke situation is easier. The high prices quoted apparently have had no effect on the anxiety of

the foundries to secure supplies. Some furnace coke was disposed of to a blast furnace in southern Ohio last week at \$15, Connellsville ovens, which, with a freight rate of \$2.80 would make the delivered price \$17.80. Connellsville coke is quoted at \$15 to \$16 for prompt shipment, with some small contracts being made for last half at \$14. It is reported that some Wise County coke is available at \$13.50, ovens.

Finished Material.—With the railroad situation showing improvement in this territory, sheet mills operating in southern Ohio are able to ship more of their products than has been the case for some time past. While the tie-up was at its worst, shipments to manufacturers in Dayton, Springfield, Columbus, Indianapolis and Cincinnati were being made by truck, and a considerable tonnage of sheets was also shipped by traction lines to automobile manufacturers in Detroit. The demand for sheets continues heavy, though there is not the mad scramble in evidence some months ago, and mills, in order to take care of all their customers, are forced to cut down on orders, so that manufacturers are able to secure only about 50 per cent of their requirements. Mills are still operating up to their capacity, and report enough business in sight to keep them running full for the rest of the year. The structural field is quiet, not much new construction of an industrial nature developing. The L. Schreiber & Sons Co., Cincinnati, has been awarded a contract for the steel work on the new foundry of the Williamson Co. at Oakley, involving 175 tons. Bids have been asked for a building for the Franklin Tractor Co., Greenville, Ohio, requiring about 100 tons. Warehouse business continues brisk, and stocks are being rapidly depleted. Small bars and strip steel are very much in demand, and premiums are being offered local jobbers for this class of material. Wire nails and wire fencing are also very scarce, shipments from mills not being anywhere near sufficient to care for the demand. Prices show no change from those prevailing during the past few weeks.

Jobbers quote: Iron and steel bars, 5c. to 6c.; structural shapes, 5.10c.; plates, 5c.; steel bands, 6.25c. base; No. 10 blue annealed, 7.50c.; No. 28 black sheets 9c.; No. 28 galvanized sheets, 10c. to 11c.

Old Metal.—The scrap market is reported by some dealers stronger than for some weeks past. Some inquiries are being received from the Pittsburgh district for steel scrap and a number of sales are reported to have been made. The railroad situation has improved to such an extent that dealers are now able to make shipments in a small way to consuming points North and East. While the market, as a whole, has a firmer tendency, there are a number of soft spots, but prices on the whole show no change from those prevailing last week. The Pennsylvania Railroad is offering a small tonnage.

Per Gross Ton	
Bundled sheets.....	\$16.00 to \$17.00
Old iron rails.....	27.00 to 28.00
Relaying rails, 50 lb. and up.....	48.00 to 49.00
Rerolling steel rails.....	29.00 to 30.00
Heavy melting steel.....	21.50 to 22.50
Steel rails for melting.....	24.00 to 25.00
Car wheels.....	29.00 to 30.00
Per Net Ton	
No. 1 railroad wrought.....	\$25.00 to \$26.00
Cast borings.....	11.50 to 12.00
Steel turnings.....	9.50 to 10.00
Railroad cast.....	31.00 to 32.00
No. 1 machinery.....	35.00 to 36.00
Burnt scrap.....	32.00 to 33.00
Iron axles.....	29.50 to 30.00
Locomotive tires (smooth inside).....	23.50 to 24.50
Pipes and flues.....	17.00 to 17.50
Malleable cast.....	22.00 to 22.50
Railroad tank and sheet.....	16.00 to 16.50

The Westinghouse Lamp Co. of Pittsburgh, announces that it has decided to build an incandescent lamp factory in Indianapolis similar to its plant at Trenton, N. J., which will have a production of from 50,000 to 70,000 lamps a day. The estimated cost of the building and equipment of the factory is \$2,500,000.

The St. Louis Coke & Chemical Co. recently obtained a temporary injunction in the federal court at Springfield, Ill., restraining the building trades unions and their officers who are conducting a strike at its uncompleted plant at Granite City, Ill., from acts tending to interfere with erection work.

Philadelphia

PHILADELPHIA, June 1.

Realizing that rail transportation is to a large extent the key to the industrial situation, the iron and steel trade has recovered somewhat from the despondency of the last few weeks as a result of a considerable improvement in freight movements, particularly on the Pennsylvania Railroad. This road is now receiving shipments for almost all points on its lines, in many cases without permits, and will even deliver cars to connecting roads. The worst feature of the rail tie-up that lingers is the difficulty in obtaining sufficient quantities of coal and coke. From every point of view, however, the situation as it affects iron and steel production and shipments is decidedly better than a week ago.

Consumers, also, are apparently more cheerful, as there have been more inquiries than in any week in the past month. In plates alone one company figures up a total of about 50,000 tons, for which inquiries are pending. This includes about 13,000 tons wanted by the Pennsylvania Railroad and 16,000 tons sought by a Pacific Coast shipyard. A locomotive builder wants 2000 tons, and there are numerous other inquiries ranging from 100 tons upward. The Pennsylvania Railroad is also inquiring for 2200 tons of shapes and about 2000 tons of bars, all for last half. There is an inquiry for basic pig iron, the first in some time, and the Norfolk & Western is in the market for approximately 5000 tons of foundry iron. These inquiries a few weeks ago would not have been considered important, but coming after three or four weeks in which there has been practically no activity they are believed to indicate a better feeling.

The strike of longshoremen at Philadelphia, which occurred last week, is disturbing to those mills which have booked considerable export tonnage, as both New York and Philadelphia ports are now closed, an embargo having been declared against transportation by rail of shipments for export from Philadelphia. Baltimore is open and some shipments are being diverted to that port.

Automobile manufacturers are beginning to ask for cancellation or suspension of contracts, particularly for special steels. This is said to indicate nothing more than a realization that automobile production, as estimated for the year, cannot be maintained.

Prices are without change, and with the exception of plates and shapes, which have been slightly easier for the past 30 days, there is no apparent weakness. Some consumers are declining to buy ahead because of a belief that prices will go lower, but there is no marked indication of such a trend as yet.

Ferroalloys.—An eastern steel company has bought 3000 tons of spiegeleisen for last half, the price being reported to be \$75, furnace. A sale of 200 tons of ferromanganese for last half is also reported at \$200, delivered. Otherwise the alloy market is quiet. There have been a few sales of spot ferromanganese, mostly resale material, at \$225 and upward.

Pig Iron.—The market continues quiet but firm, prices showing no yielding from the levels which have been maintained. Although the past week has been quiet so far as actual sales are concerned, there is a little better inquiry, some "feelers" for last half being in the market. The N. & G. Taylor Co., Cumberland, Md., seeks 1800 tons of basic iron per month for third quarter or last half, but is expected to buy in Pittsburgh. The Norfolk & Western Railroad has an inquiry out for about 5000 tons of iron, of which 1740 tons is to be malleable, and the remainder foundry grades, ranging in silicon from 2 to 4 per cent. This iron is for delivery over last half. Furnace operations are at a better rate, but there is still difficulty in getting coke. For spot coke \$15 and \$16, Connellsville, has been paid when a supply was urgently required. Shipments of iron are going out more freely in this district, although it is still difficult to ship to New England. Some Eastern consumers have already received their entire June quota of iron. Furnaces are freeing their banks of piled iron.

The following quotations are for iron delivered in consumers' yards in Philadelphia or vicinity, except those for low phosphorus iron, which are f.o.b. furnace:

East. Pa., No. 2 X, 2.25 to 2.75 sil..	\$47.15 to \$49.35
East. Pa., No. 2 plain, 1.75 to 2.25 sil.	45.90 to 48.10
Virginia No. 2 plain, 1.75 to 2.25 sil..	49.10
Virginia No. 2 X, 2.25 to 2.75 sil....	50.35
Basic deliv. eastern Pa.....	44.80
Gray forge	43.00 to 44.00
Standard low phos. (f.o.b. furnace)...	52.00
Malleable	46.75
Copper bearing low phos. (f.o.b. furnace)	47.00

Coal and Coke.—The coal and coke situation is today the most disturbing feature. Fancy prices have been paid for gas coal by eastern steel plants to avoid shutting down. In several instances from \$8 to \$10 at the mines has been paid for prompt delivery fuel. Prices of coke also continue high, \$15 and \$16, Connellsville, having been paid for spot deliveries of furnace and foundry grades.

Semi-Finished Steel.—High prices are being asked for billets for early delivery, but buyers are wary and pay the prices asked only in cases of extreme necessity. One company has inquiries totaling about 25,000 tons, the inquiries ranging from 100 to 5000 tons each. Those producers which are asking \$80 and \$85, Pittsburgh, for forging billets are finding it difficult to persuade buyers to pay these prices. Open-hearth reolling billets are quoted at \$60 to \$65, Pittsburgh, by one eastern mill, though some others ask about \$70.

Plates.—An eastern company has before it inquiries for plates totaling about 50,000 tons, the demand in the last week having shown an improvement over the few weeks just preceding. The Pennsylvania Railroad is in the market for about 13,000 tons for last half, a Pacific Coast shipyard wants 16,000 tons, a locomotive builder 2000 tons and there are numerous other inquiries. An eastern mill has taken 5000 tons of ship plates for export. The price situation is peculiar. Some eastern mills continue to quote 4c., Pittsburgh, and are getting it without difficulty—when early delivery can be promised. Plates have been sold in the past week for shipment in two or three weeks. In some respects, however, the market is weaker. A Pittsburgh mill, it is reported, has quoted below 3.50c., Pittsburgh. It is comparatively easy now to do 3.50c. to 3.75c., especially on tank or universal plates, though 4c. is asked in most instances for specification plates. The longshoremen's strike at Philadelphia, which has resulted in an embargo on export shipments from this port, may force some companies which have sold plates for export quite heavily to seek domestic tonnage for prompt shipment to take the place of export rollings which have been scheduled.

Structural Material.—Owing to the relatively small amount of building work in prospect, the demand for structural shapes is not active, but there was a little more business in the past week than in preceding weeks. An export sale of 4000 tons was made and the Virginia Bridge & Iron Works placed 1000 tons for a silk mill at Hopewell, Va. One company continues to quote 4c. on shapes and is taking some orders at this price, but the market generally may be quoted at 3.25c. to 3.75c., Pittsburgh.

Bars.—The Pennsylvania Railroad is in the market for about 2000 tons of bars, on which Eastern mills are quoting. There continues a good demand for bars. One eastern company has been asked by some of its customers to cover them for third quarter and will probably do so soon. A Youngstown steel company will take specifications for 20-in. bar mill products for delivery in six to eight weeks, its price being 3.75c., Pittsburgh. An eastern company has an inquiry for 2000 to 3000 tons of spring steel.

Sheets.—An eastern maker of blue annealed sheets, though well sold up, continues to take a little business from regular customers at 5.50c., base, Pittsburgh. Another eastern maker is quoting 6.50c. for No. 10 blue annealed, 7c. for black and 8c. for one-pass cold rolled, all f.o.b., Pittsburgh.

Old Material.—The scrap market is inactive and weak. Mills are not buying, and such trading as is going on is chiefly between dealers. Heavy melting steel is off about 50c. a ton compared with a week ago; car wheels are \$2 lower and pipe is off \$1 to \$1.50. We quote for delivery at consuming points in this district as follows:

No. 1 heavy melting steel.....	\$22.50 to \$23.00
Steel rails rerolling.....	32.00 to 33.00
No. 1 low phos., heavy 0.04 and under	30.00 to 31.00
Car wheels.....	38.00 to 40.00
No. 1 railroad wrought.....	33.00 to 34.00
No. 1 yard wrought.....	27.00 to 28.50
No. 1 forge fire.....	18.50 to 19.00
Bundled skeleton.....	18.50 to 19.00
No. 1 busheling.....	20.00 to 21.00
No. 2 busheling.....	17.00 to 18.00
Turnings (short shoveling grade for blast furnace use).....	18.00 to 19.00
Mixed borings and turnings (for blast furnace use).....	17.50 to 18.00
Machine-shop turnings (for rolling mill and steel works use).....	18.50 to 19.00
Heavy axle turnings (or equivalent).....	20.00 to 20.50
Cast borings (for rolling mills).....	20.00 to 21.00
Cast borings (for chemical plants).....	21.50 to 22.50
No. 1 cast.....	37.00 to 38.00
Railroad grate bars.....	31.00 to 33.00
Stove plate (for steel plant use).....	28.00 to 29.00
Railroad malleable.....	28.00 to 29.00
Wrought iron and soft steel pipes and tubes (new specifications).....	22.50 to 23.50
Iron car axles.....	45.00 to 46.00
Steel car axles.....	42.00 to 44.00

Chicago

CHICAGO, June 1.

An attempt of the Chicago Yardmen's Association to hasten the award of the railway wage board by calling a new strike Saturday, including firemen and engineers as well as switchmen, has been branded a failure by the railroad managers, having affected only two local lines, the Chicago Junction and the Chicago & Alton. Generally speaking, transportation has shown some improvement, although reports from different industries are conflicting. The Illinois Steel Co. still has but 19 out of 29 blast furnaces in operation and is producing finished steel at the rate of about 75 per cent of ingot capacity. The accumulation of finished steel in the yards waiting for cars has increased to 55,000 tons or 15,000 tons in excess of the total of a week ago. The foremost independent has refired its remaining blast furnace and is producing at the rate of from 75 to 80 per cent of normal. Other mills and furnaces are somewhat better off than last week.

Despite the fact that buying has not been much in evidence during the past month, the amount of business in the form of specifications and otherwise which has come to the leading interest from many sources is surprisingly large. In fact, it is probable that unfilled tonnage records for this year have been broken. The foremost independent also has heavy bookings in bars and sheets, which probably preclude taking further orders for 1920 delivery unless operation shows decided improvement. It is in a position, however, to take on further business in plates, heavy structurals and semi-finished material. There continues to be an unabated demand for bolts and nuts and wire products, while pig iron, cast iron pipe and scrap are quiet.

Pig Iron.—The market is even quieter than a week ago, activity being confined to spot business. The foremost producer of merchant iron is selling an occasional car of No. 2 foundry at \$43, furnace, and consignments of Virginia and southern foundry are bringing \$44, furnace, and \$42, Birmingham, respectively. A small lot of spot malleable sold at \$46.25, Valley. The Inland Steel Co. has refired its third blast furnace, which it will employ partly on old commitments and partly on new business, having recently booked a tonnage of basic at \$43, furnace. The leading merchant iron interest continues to move shipments at the rate of production, but has thus far been unable to cut down its accumulations on furnace banks materially. Some outside furnaces are commencing to anticipate shipments against second half business, indicating that their backlogs have been wiped out. The principal producer of by-product coke in this district has been unable to increase its output. Still being on an 80 per

cent basis at its local plant and on 40 and 25 basis at Milwaukee and Joliet respectively. Beehive foundry coke is difficult to obtain, but in recent sales has brought \$15, Connellsville for prompt delivery and \$12.50 to \$13.50 for second half shipment. The fuel problem is still a bugbear for melters, although some who were fortunate in securing a good supply ahead are operating full blast. Where foundries are attached to manufacturing plants, a shortage of material of one kind or another for finishing operations has in some cases forced a curtailment of output.

The following quotations are for iron delivered, at consumers' yards except those for Northern foundry, malleable and steel-making irons, including low phosphorus, which are f.o.b. furnace and do not include a switching charge averaging 50c. per ton.

Lake Superior charcoal, averaging sil. 1.50 (other grades subject to usual differentials), deliv. at Chicago....	\$57.50
Northern coke, No. 1, sil. 2.25 to 2.75.....	45.25
Northern coke foundry, No. 2, sil. 1.75 to 2.25.....	43.00
Northern high phos. foundry.....	43.00
Southern coke No. 1 foundry and No. 1 soft sil. 2.75 to 3.25.....	50.20
Southern coke No. 2 foundry sil. 2.25 to 2.75.....	48.70
Southern foundry sil. 1.75 to 2.25.....	47.00
Malleable not over 2.25 sil.....	43.50
Basic.....	42.00
Low phos. (copper free).....	54.00
Silvery, 7 per cent.....	\$56.40 to 59.80

Ferroalloys.—The market is slow in all ferroalloys. One producer has offered 50 per cent ferro-silicon for late June and July delivery at \$82, freight allowed to the middle west.

We quote 75 to 80 per cent ferromanganese, last half, delivered, \$200; spot, delivered, \$235 to \$250; 50 per cent ferrosilicon at \$85 delivered; spiegeleisen, 18 to 22 per cent, \$70 furnace.

Plates.—The cancellation of tonnage for Japan and China has released a fair amount of plates for early delivery. The leading independent is booking business at 3.77c., mill, and two Eastern independents are now quoting 3¾c., Pittsburgh. Bookings of steel for railroad car construction have been light. The leading interest will supply 400 tons of plates, shapes and bars and 40 tons of axles for 18 passenger service cars to be built by the Pullman Co. for the Central of Georgia. The Big Four is inquiring for 3000 freight cars of 40-ton capacity, which will call for about 5000 tons of steel. One hundred cane cars and 50 freight cars for a Cuban railroad will require 700 tons. The Standard Steel Car Co. will construct 500 ventilated box cars involving 4000 tons, exclusive of 700 tons of axles, for the Atlantic Coast Line. The Southern Pacific wants six motor and six trailer cars requiring 100 tons of steel, exclusive of axles.

The mill quotation is 2.65c. to 4c., Pittsburgh, the freight to Chicago being 27c. per 100 lb. Jobbers quote 4.17c. for plates out of stock.

Structural Material.—Although the foremost independent is well booked ahead on lighter sections, it is in a position to take on additional commitments in heavier structurals at about 3.52c., mill. The leading interest is accepting additional business here and there at the prices of March 21, 1919, while two prominent Eastern independents are offering early delivery at 3.75c., Pittsburgh. A third Eastern interest continues to quote 4c., Pittsburgh. On the whole, the market is quiet and fabricating business is at a low ebb. Only one award is to be noted this week, namely, 156 tons, to be furnished by the American Bridge Co. for the Durand Steel Locker Co., Chicago Heights, Ill. The plans for the Chicago Union Station are being revised to provide for an office building in the head house. This change will increase the tonnage of fabricated steel in the structure from 17,000 to 30,000.

The mill quotation is 2.45c. to 4c., Pittsburgh, which takes a freight rate of 27c. per 100 lb. for Chicago delivery. Jobbers quote 3.97c. for materials out of warehouse.

Railroad Rolling Stock.—In addition to the car orders and inquiries mentioned in the plate paragraph, the Chesapeake & Ohio has ordered 1000 gondola cars of 100 tons capacity, one half to be built by the Pressed Steel Car Co. and the remainder by the Standard Steel Car Co. The Illinois Central has purchased 52 loco-

motives of the 2-10-2 type from the Lima Locomotive Corporation and 25 Pacific type from the American Locomotive Co.

Bars.—The demand for mild steel bars continues strong, but two large Eastern independents who have heretofore asked 4c., Pittsburgh, for prompt delivery, are now quoting 3½c. Another large eastern interest is still asking 4c. The leading local independent is practically sold out for the year and the foremost interest is taking on additional tonnage in a very limited way for indefinite delivery, principally for car construction work. Bar iron and rail-carbon steel bar mills continue to limit their new commitments to regular customers. They have noted but little, if any, abatement in the demand, and in the case of bar iron are asking a premium of ¼c. on light sections to discourage further orders in those sizes.

Mill prices are: Mild steel bars, 2.35c. to 4c., Pittsburgh, taking a freight of 27c. per 100 lb.; common bar iron, 3.75c. to 4c., Chicago; rail carbon, 3.75c., mill.

Jobbers quote 3.87c. for steel bars out of warehouse. The warehouse quotation on cold rolled steel bars is 5.80c. for rounds and 6.30c. for flats and squares, an extra of 15c. per 100 lb. applying to orders exceeding 1000 lb. and under 2000 lb. and an extra of 35c. for orders up to 1000 lb.

Rails and Track Supplies.—The leading interest has received an order from a western road for 500,000 tieplates, totaling 3000 tons, for indefinite delivery. Aside from this tonnage, the feature of the week has been the receipt of rail inquiries from a number of lines for 1921 delivery. The local mill, however, is yet unwilling to quote on business for next year. There continues to be a fair amount of inquiry for track fastenings and light rails.

Standard Bessemer rails, \$45 to \$55; open hearth, rails, \$47 to \$57. Light rails, 2.45c. to 3.50c. f.o.b. makers' mills. Standard railroad spikes, 3.55c. to 4c., Pittsburgh. Track bolts with square nuts, 4.90c. to 5c., Pittsburgh. Steel tie plates and steel angle bars, 2.75c., Pittsburgh and Chicago; tie plates, iron, 3.75c. f.o.b. makers' mills.

Wire Products.—Shipments from the western plants of the leading interest are steadily improving with the result that commitments, which are being added on a replacement basis, are increasing. The demand for nails, plain wire and staples is unabated, but inquiry for fencing has fallen off because of the advanced season. For mill prices, see Finished Iron and Steel, f.o.b. Pittsburgh, page 1629.

Cast-iron Pipe.—Although no new inquiries have been received, several fair-sized jobs are in view. On the whole, however, the market is quiet with prices firm and unchanged.

We quote per net ton f.o.b. Chicago, ex-war tax as follows: Water pipe, 4-in., \$79.80; 6-in. and above, \$76.80; class A and gas pipe, \$2 extra.

Bolts and Nuts.—The production outlook is better for the first time in months. Bolt and nut plants which have been operating at a 50 per cent of capacity or less, are gradually increasing their output and shipping more freely. It is not to be inferred, however, that the long gap between supply and demand will soon disappear. On the contrary, several recent inquiries from automobile companies for large quantities of rivets and nuts went begging. For mill prices, see Finished Iron and Steel, f.o.b. Pittsburgh, page 1629.

Jobbers quote structural rivets, 5.37c.; boiler rivets, 5.47c.; machine bolts up to ¾ x 4 in., 30 per cent off; larger sizes 20 off; carriage bolts up to ¾ x 6 in., 20 off; larger sizes, 15 off; hot pressed nuts, square tapped and hexagon tapped, 50c. off; coach or lag screws, gimlet points, square heads, 40 per cent off. Quantity extras are unchanged.

Old Material.—While there has been a little trading by dealers and a small amount of buying by consumers, the market is still decidedly slow. The tendency in prices is downward, although less so than a week ago. Sellers believe that prices have practically reached the bottom, but consumers are not yet convinced and in some cases predict a further decline. Transportation has improved and dealers are engaged in filling old orders, although a shortage of labor in their yards is a deterrent factor. The dearth of labor is also affecting the offerings of the railroads, a list of a 1000 tons advertised by the Pennsylvania Northwest Region, be-

ing entirely mixed scrap. The Pittsburgh office of the Pennsylvania also offers 1000 tons.

We quote delivery in consumers' yards, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Iron rails	\$34.00 to \$35.00
Relaying rails	50.00 to 55.00
Car wheels	36.00 to 37.00
Steel rails, rerolling	31.50 to 32.00
Steel rails, less than 3 ft.	26.50 to 27.00
Heavy melting steel	22.50 to 23.00
Frogs, switches and guards, cut apart	22.50 to 23.00
Shoveling steel	22.00 to 22.50
Low phos. heavy melting steel	27.00 to 27.50
Drop forge flashings	17.50 to 18.50
Per Net Ton	
Iron angles and splice bars	\$30.50 to \$31.50
Steel angle bars	22.25 to 22.75
Iron arch bars and transoms	31.50 to 32.50
Iron car axles	39.00 to 40.00
Steel car axles	32.50 to 33.50
No. 1 busheling	18.00 to 18.50
No. 2 busheling	12.50 to 13.00
Cut forge	23.00 to 23.50
Pipes and flues	15.50 to 16.00
No. 1 railroad wrought	25.50 to 26.00
No. 2 railroad wrought	23.00 to 23.50
Steel knuckles and couplers	22.50 to 23.00
Coil springs	24.00 to 24.50
No. 1 cast	36.50 to 37.50
Boiler punchings	23.50 to 24.00
Locomotive tires, smooth	23.00 to 23.50
Machine shop turnings	9.50 to 10.00
Cast borings	11.50 to 12.00
Stove plate	28.50 to 29.00
Grate bars	28.50 to 29.00
Brake shoes	24.50 to 25.00
Railroad malleable	25.50 to 26.00
Agricultural malleable	25.00 to 25.50
Country mixed	16.00 to 17.00

San Francisco

SAN FRANCISCO, May 25.

There is little change in the local iron and steel markets. Freight conditions in California are said to be showing an improvement, and some shipments coming from the South are coming through with more or less promptness.

Bars.—Bars are quoted as unchanged at 4.25c., but notwithstanding the fact that there is far from an active demand it is difficult to get spot deliveries at this figure, according to some dealers. There is no floating stock of bars in this market and the holders of bars are strong enough to hold them until the market becomes more active. This condition is apt to develop at any time if the transportation situation improves sufficient to permit the resumption of building on a large scale.

Structural Steel.—While there is known to be a large demand for structural steel being held up by the general lack of building material, there has been very little movement in structurals during the past two weeks.

Cast-Iron Pipe.—The demand for cast-iron pipe is more or less apathetic. Stocks in the city are said to be in fair condition and compared with other materials there is no shortage.

Wrought Pipe.—The representatives of the wrought pipe mills state that the demand for their product is almost unprecedented in the California oil fields, but that the amount arriving from the mills is pitifully small.

Pig Iron.—There have been but few inquiries for pig iron, but it is believed that only slight price concessions are necessary to bring out a good demand.

Old Material.—There is no improvement in the scrap situation. Heavy melting steel still sells at \$27. Cast-iron scrap is strong at \$47.50 per net ton f.o.b. foundry.

American Steel & Wire Co. Changes

CLEVELAND, June 1.—Jay Waldeck has been appointed manager of the American Steel & Wire Co.'s wire mills in the Cleveland district, succeeding Robert W. Ney, who has been assigned to other duties. Mr. Waldeck, who has been assistant manager of the Cleveland district mills, has been succeeded by G. H. Peters, who was superintendent of the Cuyahoga Works, Cleveland. Fred Ingraham, superintendent the American Works, has succeeded Mr. Peters at the Cuyahoga Works, and Charles F. Kempert, who has been assistant superintendent at the American Works, has succeeded Mr. Ingraham.

Cleveland

CLEVELAND, June 1.

The railroad situation in this territory improved materially during the week. Carload shipments of steel are now coming through from the Pittsburgh district in fairly good shape and local mills are not having so much trouble in shipping out their products. Pig iron is moving quite freely to outside points and from outside furnaces to local consumers, but Cleveland furnaces are still having difficulty in moving iron to local foundries, as permits are still required for cars that have to be transferred to another road.

Iron Ore.—The effect of the railroad strike on the movement of ore is shown in the record of shipments during May. Shipments during the month with the last three days estimated were 6,400,000 gross tons as compared with 6,615,341 tons during May, 1919. The movement by water to June 1 was approximately 6,630,000 tons as compared with 8,027,580 tons during the same period a year ago. However, early season shipments were slow last year. Up to June 1, 1918, Lake shipments exceeded 9,000,000 tons. The car supply has improved materially at the lower Lake docks that move the bulk of the ore, but there is little improvement at some of the smaller docks. The Pittsburgh Steamship Co. has put its barges into commission and practically the entire Lake fleet will be moving this week. Boats are being delayed for unloading, but they are saving time in going up the Lakes light, as little coal is moving.

We quote, delivered lower Lake ports: Old range Bessemer, \$7.45; old range non-Bessemer, \$6.10; Mesaba Bessemer, \$7.20; Mesaba non-Bessemer, \$6.55.

Pig Iron.—The demand for prompt shipment foundry iron has improved, but this is attributed to a large extent to the blowing out of one Cleveland furnace that had been running on this grade and has unfilled contracts. There is also some activity in early shipment of southern iron. A Portsmouth, Ohio, consumer is inquiring for 10,000 tons of basic iron for early shipment, and some inquiry for basic iron has come from other districts, but there is apparently little basic available in this territory. One interest reports sales aggregating 3000 tons in foundry iron during the week in lots up to 1000 tons, mostly for last half. Foundries are crowding furnaces for deliveries and some are asking that shipments on last half contracts be anticipated. Sales of 1.75 to 2.25 silicon iron are being made at \$44 for northern foundry iron for last half and at \$42 for southern iron for early shipments.

We quote delivered Cleveland, as follows, based on 40c. switching charge for local iron, a \$1.40 freight rate from Valley point, and \$5 from Birmingham:

Basic	\$43.40
North. No. 2 foundry sil. 1.75 to 2.25..	45.40
Southern foundry, sil. 2.25 to 2.75..	48.70
Gray forge	41.40
Ohio silvery, sil. 8 per cent.....	61.40
Standard low phos., Valley furnace..	51.00 to 53.00

Ferromanganese.—Several carloads of southern ferromanganese were sold in this market during the week at \$250 per ton for early shipment. The orders came from consumers who have been unable to get shipments from the East.

Coke.—Sales of spot shipment Connellsville foundry coke were made in Cleveland at as high as \$16.50 per ton during the week, but other sales were made at \$14. Deliveries have further improved to many points in this territory. We quote standard Connellsville foundry coke at \$13 to \$14 for early shipment.

Finished Iron and Steel.—Demand for steel is only moderate. Consumers are still using up the steel already contracted for and are pressing the mills for delivery. The slowing up in the automobile industry so far has not resulted in any noticeable lessening in the demand for steel from motor car builders. Cold-rolled steel, black and galvanized pipe, tin plate and wire nails are in heavy demand and are very scarce. One Pittsburgh mill quickly sold at 4.25c. 2000 tons of cold-rolled steel bars allotted to this territory. We note the sale of 500 tons of Bessemer wire rods at \$80 per ton. Plates are quiet, with 3.50c. to 3.75c. as the

usual quotation. Steel bars are still bringing 4c. for early shipment and small lot orders for structural material are being taken at the same price. With but little activity in the building trade, the demand for structural shapes is light. Some inquiry for sheets for third quarter and last half are coming out, but some consumers are inclined to buy very conservatively. High premium prices on sheets are less in evidence.

Cleveland warehouses quote steel bars at 3.27c. to 5c.; plates, 3.57c. to 5c., and structural material, 3.70c. to 5.10c.

Bolts and Nuts.—Manufacturers are taking third quarter contracts from jobbers and consumers and about all the makers have got up to a higher price basis, the usual quotations being as follows: Machine bolts, rolled threads, 40 and 5 off; cut threads, 30 and 10 off; larger and longer, 30 off; carriage bolts, rolled threads, 30 and 10 off; cut threads, 30 off; larger and longer, 25 off. While shipping conditions have improved, local bolt and nut makers are able to ship only 60 to 70 per cent of their product.

Old Material.—The market is very weak and dull. The sale of 1500 tons of heavy melting steel is reported to a Cleveland mill at \$20.50. However, the purchaser often accepts scrap that is rejected by more particular consumers and the price is not regarded as representative of the market. This grade is quoted around \$24 for Valley delivery, and dealers are paying from \$24.50 to \$24.75 for shipment to a Youngstown mill. Machine shop turnings, mixed borings and turnings, and short turnings are lower. Flashings are very weak. Sales of machine shop turnings are reported to a local consumer at \$11.50 to \$12 and a dealer has paid the lower price for this grade. Dealers are finding it about as difficult to move scrap as a week ago.

Dealers quote delivered consumers' yards in Cleveland and vicinity as follows:

Heavy melting steel.....	\$23.50 to \$24.00
Steel rails, under 3 ft.....	25.00 to 27.75
Steel rails, rerolling.....	31.00 to 32.00
Iron rails	32.00 to 33.00
Iron car axles.....	41.00 to 42.00
Steel car axles.....	36.00 to 37.00
Low phos. melting scrap.....	26.25 to 26.50
Cast borings	16.50 to 16.75
Machine shop turnings.....	11.50 to 12.00
Mixed borings and short turnings.....	15.50 to 16.00
Short turnings for blast furnaces.....	15.50 to 16.00
Compressed steel	18.25 to 18.75
Railroad wrought	28.00 to 29.00
Railroad malleable	30.00 to 31.00
Steel axle turnings.....	19.50 to 20.00
Light bundle sheet scrap	15.00 to 15.50
Drop forge flashings over 10 in	14.50 to 15.00
Drop forge flashings under 10 in.....	16.50 to 17.00
No. 1 cast.....	41.00 to 42.00
No. 1 busheling.....	18.50 to 18.75
Railroad grate bars.....	29.00 to 30.00
Stove plate	29.00 to 30.00
Cast iron wheels.....	37.00 to 38.00

Making Brass Products

To commemorate the introduction of electric brass melting into commercial practice, the Bridgeport Brass Co. has prepared a book which it has entitled "Brass" and which describes and illustrates the art of brass making. Many of the illustrations are those of photographs which have recently been reproduced in the columns of THE IRON AGE in a recent series of articles by Otis Allen Kenyon, devoted to the methods followed in the plant of the Bridgeport Brass Co. in making tubes, sheets and rods. The company now makes all its brass in electric furnaces.

The book comprises 78 pages copiously illustrated and altogether a noteworthy example of the printing and illustrative arts. It takes up the matter of brass making as practiced several hundred years ago and then as now followed by the Bridgeport company. Besides describing the plant and processes, the book discusses the properties of brass as affected by composition, cold working and heat treatment, with the idea of assisting engineers in drawing specifications. The publication is also noteworthy in that it represents a deviation from the lifelong tradition of the brass industry, which has been conspicuously secretive. The book is, of course, intended for distribution among users of brass and brass products.

JAPANESE CONDITIONS WORSE

Japanese Government Inquires for Material—Sweden, Holland and Germany Buy Pig Iron

Reports from Japan are anything but optimistic. Cables from Tokio, Yokohama and Kobe agree that there is no improvement and some exporters have reports that conditions are rapidly growing worse with the prospect of a real panic in a few weeks. The Mogi Bank recently failed. Quantities of material being sold in Japan have been purchased in China and a few purchases are being made by the larger concerns in Japan, when material is offered at a low price, obviously to be held in stock for a future demand. Government inquiries are still being issued, among those in the market being one for about 10,000 tons of ship plates, bars and shapes and another for 75 bridge spans, totaling about 4,000 tons.

Business with European markets is fair, improving proportionately to the rise in the exchange rate with the various countries. Foundry iron is still being inquired for rather heavily, chiefly from Holland and Sweden. One exporter in the past week booked orders for 4,500 tons of foundry iron to these two countries, a large part of the tonnage to Holland being for shipment into Germany. The Italian market is quiet. The New York branch of a British concern which did not ship to Italy for a period of about three months, has resumed shipments.

In South America, Buenos Aires and Rio de Janeiro are the most active. Central American markets are also active. Inquiries from Cuba for all kinds of material are reported as heavy.

Improvement in transportation has been sufficient to bring exporters back to the port of New York to make shipments, although a number still find it easier to use Philadelphia or Boston.

Substitute Materials Used in German Machinery

BERLIN, GERMANY, May 14.—During the course of the war the German machine industry was up against the problem of providing suitable substitutes for the manufacture of parts formerly made of steel, brass, bronze. Practically every available ounce of metals was commandeered by the munitions works. Every possible substitute was given a chance, and among the various industries that contributed toward relieving the situation by supplying substitute materials the building trade and the building materials industry ranked foremost. The magnesite compound which, for instance, in pre-war times had been used with excellent results as a substitute for board flooring, beams, slabs, joists, etc., proved very satisfactory in the manufacture of file handles, small levers, machine handles, knobs, and so on, as well as of friction plates and disks.

Real marble, formerly used for switchboards, was replaced by a cement-asbestos composition or marble impastation, the latter being composed of marble cement, Portland cement, magnesite cement and gypsum, while a similar impastation was advantageously employed in the manufacture of many parts required by the electro-technical industry. Soapstone (steatite) and porcelain were in many cases substituted by serpentine stone, while artificial slate came in very handy for the manufacture of switchboards.

Asbestos, of which there was a great scarcity, made room for slag wool. Extensive experiments carried out with a view of producing artificial grinding materials showed that tungsten combinations were well adapted for the desired purpose and artificial grindstones and millstones made of a magnesite composition with an addition of hard grinding materials are claimed to have proved a success.

Furthermore, the experience gained with concrete as a substitute for cast iron in the manufacture of large machine parts subject to pressure only has been fully taken advantage of by machine builders with the result that concrete is now increasingly used for the aforementioned purpose, special machines having been

designed for casting the parts. That wood proved its serviceableness in numerous cases goes without saying, having been especially employed for substituting cast iron in small machines.

With the lifting of the blockade and the conclusion of peace, Germany is now once more in a position to purchase, as far as her depreciated currency permits, foreign raw materials, of which her industries stand in great need. A good many of the substitutes hitherto employed will gradually disappear, making room for "the real thing," though there are indications that in view of the upward procession of prices for metals manufacturers will probably retain for some time to come those substitutes that have proved an unqualified success.

The question, however, whether products consisting partly or wholly of substitute materials will prove a howling success abroad remains highly problematic. German machines containing in parts substitute materials have lately been found increasingly difficult to sell abroad in the face of American and British competition. Machine builders' associations in Germany are urging their members to use first rate materials only for medium and high-priced machinery to be sold abroad and thus to feature in their advertisements such sentences as "No substitute materials enter into the construction of our machines," or "Guaranteed pre-war material."

British Iron and Steel Market

Strike at Sheffield Closes Some Plants—Steel Makers Not Quoting—Pig Iron To Be Higher

(By Cable)

LONDON, ENGLAND, June 1.

The Cleveland pig iron market is unchanged, but a revision of prices for the current month is expected. Small lots of hematite iron for June delivery are obtainable for the Allies.

Steel makers are not quoting. Bar iron for export has been advanced to £32. An advance to 40s. is expected in marked bars.

A strike of enginemen and firemen at Sheffield against the three-shift system has resulted in such firms as Hadfield's, Parkgate and others closing down and 20,000 men are idle.

Tin plates for July-September delivery have sold for 69s., basis f.o.t., and oil plates at 74s. for quarters and 107s. for 20 x 20, both for early shipment. Inquiries are good for the fourth quarter. The galvanized sheet market is easier.

We quote per gross ton except when otherwise stated, f.o.b. maker's works, with American equivalent figured at \$3.92 for £1, as follows:

	£	s.	£	s.	
Ship plates	26	0 to 34	0		\$101.92 to \$133.28
Boiler plates	28	10 to 37	0		111.72 to 145.04
Tees	20	10 to 33	0		103.88 to 129.36
Channels	25	15 to 33	5		100.94 to 130.34
Beams,	25	10 to 32	0		99.96 to 129.44
Round bars, ¾ to 3 in.	28	0 to 33	10		109.76 to 131.32
Rails, 60 lb. and up.	23	0 to 25	0		90.16 to 98.00
Billets	25	10 to 26	10		99.96 to 103.88
Sheet and tin plate bars,					
Welsh	25	0 to 32	0		98.00 to 125.44
Galvanized sheet, 24 g.	55	0 to 60	0		215.60 to 235.20
Black sheet, 24 g. to 26 g.	50	0 to 54	0		195.00 to 211.68
Tin plate, base box.	3	9 to 3	14		13.52 to 14.50
Steel hoops	38	15 to 39	0		151.90 to 152.88
Cleveland basic iron.	11	7 ½			44.59
West Coast hematite.	14	15			57.82
Cleveland No. 3 foundry (ex-					
port to allies)	10	5			40.18
Ferromanganese	35	0 to 40	0		137.20 to 156.80
Coke	3	2 ¾			12.30

The Milwaukee Electric Railway & Light Co., of which John Anderson is chief engineer, after some two years continued use of pulverized coal under five boilers in its Oneida Street plant, has decided on using this form of fuel in its Lakeside power plant now under construction. The plant will contain eight 1306-hp. Edgemoor water tube boilers. The contract for the equipment has been placed with the Fuller Engineering Co., Allentown, Pa.

IRON AND INDUSTRIAL STOCKS

Sentiment Appears to Have Undergone Change for the Better

Sentiment in financial circles appears to have undergone a change for the better of late, at least prices quoted for iron and industrial stocks would so suggest. This change of heart is due to the many favorable developments in heretofore unfavorable situations that cannot be overlooked.

Of primary importance are signs of an easier money situation and continued gold imports. Time money for the first time in months has made its appearance in large amounts. Then, too, there has been a substantial recovery in Liberty bond quotations, which makes for better credits. Again, bankers are confident that railroad equipment requirements can be financed successfully. The railroad transportation situation is slowly but surely improving; labor appears less confident; the Mexican situation is less serious than many anticipated; the possibility of reduced taxation is less remote; prices for iron and steel are holding firm while those on metal working tools are advancing. These are but some of the many favorable developments.

Of the steel stocks, Crucible has been most conspicuous on the recovery, but the consistency of United States Steel's firmness is impressive. Earnings of the automobile companies for the current quarter will be unsatisfactory, due to the railroad strike, but their earning power should steadily increase from now on. If the railroads are allowed to equip themselves efficiently, the equipment companies should earn large profits. This belief is reflected in recent price movements for such stocks. The railroad tie-up should make for a pinch in copper supplies and higher prices for the red metal.

The range of prices on active iron and industrial stocks from Tuesday of last week to Wednesday of this week was as follows:

Allis-Chalm. com. 31½-36½	Lackaw. Steel... 67½-71½
Allis-Chalm. pf. — - 75	Lake Sup. Corp... 12 - 13½
Am. Can com.... 37½-39½	Midvale Steel.... 41 - 42½
Am. Can pf..... 90½-91½	Nat.-Acme 33 - 34½
Am. C. & F. com. 132½-136½	Nat. E. & S. com. 67 - 68
Am. Loco. com.... 93½-98	Nat. E. & S. pf... — - 92½
Am. Loco. pf.... 95½-96½	N. Y. Air Brake.. 97½-100
Am. Steel F. com. 38 - 39½	Nova Scotia Steel. 51 - 52
Am. Steel F. pf... — - 87	Press. Steel com.. 96½-99½
Bald. Loco. com. 111½-116	Press. Steel pf... — - 99½
Bald. Loco. pf.... 99 - 99½	Ry. Stl. Spg. com. 93 - 97½
Beth. Steel com.. 87½-88½	Replogie Steel... 84½-88
Beth. Stl. Cl. B.. 87½-90½	Republic com.... 87 - 91½
Beth. Stl. 8% pf.. — - 107½	Republic pf..... 84 - 94½
Case, J. L. pf.... — - 94	Sloss com..... 63 - 65
Chic. Pneu. Tool.. 82 - 84½	Superior Steel... 47½-50
Colorado Fuel.... 30½-32	Transue-Williams. 51½-54½
Cruc. Steel com.. 125½-138½	Un. Alloy Steel... 41½-43½
Cruc. Steel pf.... — - 96½	U. S. Pipe com... 17 - 17½
Gen. Electric.... 142½-145½	U. S. Steel com... 91½-94½
Gt. No. Ore Cert.. 35½-36	U. S. Steel pf.... 105½-107½
Gulf States Steel. 59½-62	Vanadium Steel... 71½-75½
Gulf St. Stl. 1st pf. — - 90½	Va. I. C. & Coke. 101 - 106
Int. Har. com.... 123 - 125½	Westingh. Elec... 48 - 49½

A reception and dance was held at the Cumberland plant of the N. & G. Taylor Co., manufacturer of tin plate and forging steel, on Saturday evening, May 22, to celebrate the official opening of the new gymnasium building, which has been added to the employees' club house and restaurant. The new building is 45 x 75 ft., with 18-ft. head room, providing space for basketball games. The floor is of hard maple, waxed and polished for dancing. A two-story spectators' gallery extends the entire length of one side of the building. Lockers, shower baths and dressing rooms are provided.

The complete report of the national convention of the Society of Industrial Engineers in Philadelphia, March 24, 25 and 26, 1920, will be available in book form about May 25. The subject of the convention was entitled, "The Practical Application of the Principles of Industrial Engineering." The book contains about 25 speeches, and may be obtained, bound in either cloth or paper, from George C. Dent, 327 South La Salle Street, Chicago.

OFFICE CHANGES

The Chicago offices of the Cutler-Hammer Mfg. Co., Milwaukee and New York have been removed from the Peoples Gas Bldg., where they have been located for the last eight years, to the company's own building (323 No. Michigan Ave.) on the new Michigan Boulevard link. H. L. Dawson is manager of the Chicago Office, which handles the business of 19 states with sub-offices in Cincinnati and Detroit.

About July 1 the Newton Steel Co. will open executive offices in the Wick Building, Youngstown, Ohio. The company has obtained practically the entire ninth floor. Heretofore offices have been maintained at the plant at Newton Falls, Trumbull County, Ohio.

The Electric Controller & Mfg. Co., Cleveland, has opened a branch office in Boston, at 49 Federal Street, in charge of M. D. Goodman.

Hill, Clarke Co., Inc., machine tools, located for several years at 136 Cedar Street, New York City, have temporarily discontinued that office. The main office is at 156 Oliver Street, Boston.

General Steel Products Co., Detroit, has moved from the Dime Bank Building, into more spacious quarters in the Garfield Building, 870 Woodward Avenue. The organization is composed of John H. Miles, A. L. Tushbant and Herbert Appleby, who operate as mill representatives, giving both mill and warehouse service on steel products, such as bars, strips, sheets, tubing, etc.

Frazier & Co. announce the opening of an office in San Francisco, Cal., to provide further facilities for Pacific Coast exports and imports.

The Pennsylvania Pump & Compressor Co., Easton, Pa., announces the opening of its sales offices in the following cities: New York, H. C. Browne, manager; Philadelphia, W. J. Devlin, manager; Pittsburgh, Pa., C. W. Gellinger, manager; Richmond, Va., W. F. Delaney, manager; Birmingham, Ala., H. I. Kahn, manager; Salt Lake City, Utah, C. H. Jones, manager; Milwaukee, Wis., Coates & Zarling, representatives.

Don F. Kennedy, metallurgist and manufacturers' representative, has moved from his quarters at 1257 David Whitney Bldg., Detroit, to larger quarters at 736-38 David Whitney Bldg. Among the accounts handled by Mr. Kennedy are those of the Union Electric Steel Co., Pittsburgh, and the Towmotor Co. of Cleveland.

The Hyman Michaels Co., dealer in salvaged material and scrap iron and steel, Chicago, has released the quarters it had taken in the Park Row Building, New York, and has rented offices at 1324-1326 Woolworth Building. Joseph Hyman will be in charge of the office for the time being, assisted by H. Goldsmith.

Robert Grant, iron and steel merchant, has removed from the eighteenth floor of the Woolworth Building, New York, to larger quarters on the twentieth floor, occupying an entire corner of the building. The Milliken Brothers Mfg. Co., manufacturer of all-steel industrial buildings, transmission towers, etc., an affiliated organization, has removed to the same location.

Refuse to Employ Farm Labor

The board of directors of Associated Industries of New York State, a large state association of employers, has gone on record as opposed to the employment by manufacturing and mercantile institutions of farm labor and recommends to every member of the association, and to all other employers, that they refrain from advertising for or hiring farm labor.

"One of the most important and pressing problems we face to-day," says E. J. Barcalo, of Buffalo, president of Associated Industries, "is quantity production in food stuffs on the farms. For the public generally it is more important than any problem facing industrialists. The position of the state association is obvious. We want our members to flatly refuse to hire farm help and, so far as possible, send back to the farm such experienced farm labor as has been lured by high wages into industry. It may help reduce the cost of living."

The recent proposal of the Hydraulic Steel Co., Cleveland, to its employees relating to the purchase of stock in the company, was received with enthusiasm and the full allotment of stock has been subscribed. Through these subscriptions approximately 40 per cent of the individuals in the employ of this company are now stockholders.

Decision as to Operation of Steamship Lines Through Panama Canal

WASHINGTON, June 1.—The Interstate Commerce Commission has issued its findings in connection with the application of the United States Steel Products Co. et al., relating to the ownership and operation of steamship lines through the Panama Canal. The Commission holds that the ownership by the United States Steel Products Co. and several applicant rail carriers in water lines constitutes an interest within the meaning of Section Five of the interstate commerce act. It further holds, however, that under present conditions, whatever competition there may be between the applicant rail carriers and the steamer lines of the United States Steel Products Co. operating between ports of the eastern coast of the United States and the western ports of North and South America through the Panama Canal, is and will be "unsubstantial and merely nominal." No order was issued in connection with the findings.

Commissioners Hall and Daniels, in a separate opinion, concur in the majority report as to the fact that the competition is unsubstantial and nominal, but hold that the Commission should go further and grant the application made for an order permitting the continuance of the service. The decision says:

"There are now under construction for the products company 30 steamers of a tonnage of 9680 tons each. As many of these will be placed in the service between the eastern and western coasts of North America as conditions from time to time may warrant. * * * The inauguration by one of the largest tonnage-producing industries in this country of a line of steamers in the coast-to-coast trade may, as contended by counsel for the Luckenbach Steamship Co., clear the water of the few independent lines now in existence and effectively discourage the establishment of any lines not similarly fostered. The intention of creating a monopoly, needless to say, is denied."

Will Not Declare Stock Dividends

YOUNGSTOWN, OHIO, June 1.—Stockholders of the Youngstown Sheet & Tube Co. and the Brier Hill Steel Co., at special meetings to-day, decided that the proposed increases in common capitalization would not be made at this time and that no stock dividends would be authorized. Instead, a financial reorganization will be effected, providing for the issuance of non par value common stock. Reconsideration of the directors' recommendation was determined because of the 10 per cent tax on stock dividends in the soldiers' bonus bill which has passed the House.

New Canadian Combine is Incorporated

The British Empire Steel Corporation, Sydney, N. S., has been incorporated under the joint stock companies act of Nova Scotia, and subsequently the provincial charter was issued by the provincial secretary. The capital stock of the company is \$500,000,000. The British Empire Steel Corporation first sought a Dominion charter, and application was made for incorporation to the Dominion Government under the Dominion companies act. That application has now been abandoned, and the corporation enters upon its career under a Nova Scotia charter. This will more closely identify its control with Nova Scotia, and incidentally, it means an addition of \$75,000 to the revenue of the province, which is the amount of the fee the corporation has to pay for its charter. This is believed to be the largest fee ever paid in Canada for the incorporation of a company.

While in Port Arthur, Ont., J. W. Norcross, with his touring party, inspecting the shipyards and ships on the Upper Lakes to be affected by the great Canadian steel and ship merger, several interesting statements were made by members of the party. Sir James McKeachnie, head of Vickers, Ltd., one of the largest manufacturing plants in the British Isles, said: "We are looking forward to the time when we shall be able

to get our raw materials from Canada. We are short of slabs and pig iron at present. At Sydney, N. S., we have a vast store we can draw upon, and there is no reason why we should not avail ourselves of it." Mr. Norcross, president of the Canada Steamship Lines, said the British Empire Steel Corporation when complete will have 5,000,000,000 tons of coal at its disposal.

Will Care for Industrial Cripples

WASHINGTON, June 1.—A bill for the promotion of vocational rehabilitation of persons disabled in industry has been passed by both houses of Congress and sent to the President for his signature. The House during the past week concurred in the Senate amendments to the bill as originally passed by the House.

The bill appropriates for the use of the various States in co-operation with the Federal Board for Vocational Education the sum of \$750,000 for the fiscal year ending June 30, 1921, and for the fiscal year ending June 30, 1922, and thereafter for a period of two years the sum of \$1,000,000 annually. These amounts shall be allotted to the States in the proportion which their population bears to the total population in the United States. It is necessary that each State shall expend under the supervision and control of its State Vocational Board at least an amount equal to the sum provided by the Federal Government.

The money is designed to provide for the vocational rehabilitation of persons disabled in industrial pursuits, including agriculture, trade, commerce, manufacturing, mining, transportation and all the mechanic arts, and who are without sufficient means to provide for their own rehabilitation and their return to civil employment, and who are, in the opinion of the State board, unable to carry on a gainful occupation.

Representative Fess of Ohio, chairman of the House committee on education, who pushed the bill in the House, expressed the belief that it would be regarded as one of the most humanitarian as well as the most economic and constructive pieces of legislation during the decade. He described it as an outgrowth of the vocational educational work done in connection with those crippled in the war.

Operations in Youngstown District

YOUNGSTOWN, OHIO, June 1.—Steel plant operations started the first week of June on the following basis: 56 per cent of blast furnaces, 80 per cent of open hearths, 50 per cent of pipe capacity, 90 per cent of sheet capacity, and Bessemer plant, 100 per cent.

The Youngstown Sheet & Tube Co. has started its fourth smelter at East Youngstown, and stacks in this group are at 100 per cent. The Republic Iron & Steel Co. will start another Haselton furnace this week.

Machinists Strike Drags

CINCINNATI, June 2.—The machinists' strike still drags along. No developments of an important character have transpired during the week, and no new strikes are reported. A number of men who have been on strike are drifting back to their old jobs, and some of the shops affected are taking on new men to take the places of the men now out. Employers are firm in their refusal to grant the demands of the men, and are holding strictly to their position as outlined in the declaration published some weeks ago and signed by over 80 of the larger employers of the city. Complete reports show that nearly 6000 men are out and 65 shops affected, of which about 20 per cent are closed. The week's figures show a gain of approximately 400 men at work over last week, and it is expected that this gain will be bettered during the coming week.

Resolutions endorsing the principle of the open shop and promising the support of every member of the association in attaining the open shop were passed last week at the twenty-sixth annual convention of the Pennsylvania State Association of Master Plumbers, meeting in Harrisburg, Pa.

Foreign Standardizing Bodies

The American delegates who attended the meetings of the advisory technical committees of the International Electrotechnical Commission, at Brussels, March 27 to April 1, were accompanied by Dr. P. G. Agnew, secretary of the American Engineering Standards Committee, who later visited the national standardizing bodies in Belgium, England, France and Holland.

The Association Belge de Standardization was organized by the Central Industrial Committee of Belgium—a strong organization which is playing an important rôle in the reconstruction of Belgian industry, with the support of the national engineering societies and industrial associations. While only recently organized, the association is actively at work and has already carried out several important standardization projects.

The French Commission Permanente de Standardisation differs from other national standardizing bodies in that it is strictly an official organization, and supported wholly by government funds. It is a part of the Ministry of Commerce and Industry. The commission itself has 24 members, nine representing various government departments, one representing the Academy of Sciences, and the remainder, national engineering and industrial bodies. Special provision was made in the decree establishing the commission for the co-operation of the government departments in the preparation of specifications, and the subsequent use of the specifications by the departments. The standards already adopted include specifications for electrical machinery, steel sections and various elements of machine tools, such as tool rests, lathe carriages, keys and keyways.

The British Engineering Standards Association is the oldest and largest of the national organizations, having been founded in 1901 as the British Engineering Standards Committee. Its work in organization is very extensive. There are some 275 committees actively at work, with nearly 1400 members in all, and the work requires a permanent staff of 40 in the central office. The work of the association is playing a most important rôle in British industry. The standards now in effect cover an extensive range of engineering subjects.

The "Main Committee for Standardization in the Netherlands" was organized in 1916 by the Society for the Encouragement of Industry and the Royal Institute of Engineers. Each of these societies names two members of the Main Committee, the total membership of which is 15. As in the case of Belgium, the relatively small size of the country and the industrial and commercial position necessarily affect their standardization work. Standards are issued as single sheets perforated for binding in loose-leaf folders, the idea being that they shall be issued directly to the draughtsman in the plant. The price is 15 Dutch cents (\$0.06) per sheet. Their work is proceeding very actively. New sheets are being issued at the rate of about one per week. There are 16 on the staff of the central office.

The American Engineering Standards Committee is in active co-operation with some of the other international bodies, the most important project being that of steel sections (with the British). There is an almost unlimited field for such work, and Dr. Agnew reports that he found a most cordial attitude and desire for co-operation on the part of all of the organizations which he visited.

There are similar national standardizing bodies in Canada, Germany, Sweden and Switzerland, while one is in process of organization in Italy.

Sponsors for Safety Codes Selected

Definite arrangements have been made for the formulation of a considerable number of safety codes under the auspices and rules of procedure of the American Engineering Standards Committee. The subjects of the codes for which arrangements have been completed, together with the organizations which have been designated by the committee to act as sponsors, and

who have accepted such responsibility, are as follows:

Abrasive Wheels.—The Grinding Wheel Manufacturers of the United States and Canada, and the International Association of Industrial Accident Boards and Commissions, joint sponsors.

Explosives.—The Institute of Makers of Explosives.

Foundries.—The American Foundrymen's Association and the National Founders Association, joint sponsors.

Gas Safety Code.—The U. S. Bureau of Standards and the American Gas Association, joint sponsors.

Head and Eye Protection.—The U. S. Bureau of Standards.

Paper and Pulp Mills.—The National Safety Council.

Power Presses.—The National Safety Council.

Pressure Vessels, Non-fired.—The American Society of Mechanical Engineers.

Refrigeration, Mechanical.—The American Society of Refrigerating Engineers.

Woodworking Machinery.—The International Association of Industrial Accident Boards and Commissions and the National Workmen's Compensation Service Bureau, joint sponsors.

A number of additional codes are under consideration. A large representative advisory committee of specialists, organized by the National Safety Council, the National Workmen's Compensation Service Bureau and the Bureau of Standards, at the request of the committee, to act as its advisor, is actively working on the question of what additional codes are most urgently required and what organizations are in the best position to undertake sponsorship for such codes.

Standardization of Ball Bearings

At the request of the Swiss Standards Association, Baden, Switzerland, for co-operation in the work of standardization of ball bearings, the American Engineering Standards Committee requested the American Society of Mechanical Engineers and the Society of Automotive Engineers to act as joint sponsors for the project. These societies have accepted the responsibility and are now organizing a sectional committee for the work. The sectional committee will be representative of all the interests involved and is the body which will be responsible for the formulation of the standards.

Opposed to Seasonal Freight Rates

WASHINGTON, June 1.—A brief opposing the Frey-linghuysen bill providing for seasonal freight rates on coal has been filed with the Senate committee on interstate commerce by George H. Cushing, managing director of the American Wholesale Coal Association. In the brief, Mr. Cushing charges that a campaign is under way to return coal to detailed Governmental control, and that the first step in the program is the passage of this bill. Mr. Cushing says that the purpose of the bill is to control distribution, that distribution cannot be controlled without controlling prices, that prices cannot be controlled without controlling cost of production, that cost of production cannot be controlled without controlling wages of labor, and that these successive steps will lead to complete Governmental control.

Such a program, Mr. Cushing contends, will mean the establishment of a commission form of government, not only for the railroad and the coal industry but for all industry in America. He compared such a program to the experience of New Zealand in establishing a commission form of government for business, which he says caused that country to become practically bankrupt.

The Rockford Iron Works, Rockford, Ill., has been taken over by M. H. Farrell, former foundry superintendent who has put the plant on a profit-sharing basis. In addition to the regular wage scales paid the men, they are to share in the earnings of the firm through the receipt of a bonus. The Rockford Iron Works was the first of the foundries in the city to resume work.

Non-Ferrous Metals

The Week's Prices

Cents Per Pound for Early Delivery							
	Copper New York		Tin New York	Lead		Zinc	
	Lake	Electro- lytic		New York	St. Louis	New York	St. Louis
May 26	19.00	19.00	50.00	8.50	8.15	7.90	7.55
27	19.00	19.00	51.50	8.50	8.15	7.85	7.50
28	19.00	19.00	52.00	8.50	8.15	7.95	7.60
29	19.00	19.00	....	8.50	8.15	7.95	7.60
June 1	19.00	19.00	51.50	8.50	8.15	8.05	7.70

New York, June 1.

All the markets are still inactive and devoid of any definite trend. Conditions in the copper market show some improvement so far as transportation is concerned. The tin market is only moderately active. The situation in lead has undergone little change. Zinc is still in light demand. Antimony is lower.

New York

Copper.—The holiday recess yesterday, following as it does this year the week end, has, if anything, intensified the dullness. There are signs of some improvement, due largely to a betterment in the railroad situation. Technically the market is in a strong position and that a brisk demand is sure to develop in the near future is the belief of many in the trade. Production has been diminished decidedly as well as stocks. Quotations are largely nominal. Leading producers continue unchanged their quotation of 19c. for both electrolytic and Lake copper for June delivery, with 19.25c., New York, asked for July and in some cases August. In the outside market, so-called, small quantities are reported available and sold as low as 18.25c., New York, for June.

Copper Averages.—The average price for both Lake and electrolytic copper for the month of May, based on daily quotations in THE IRON AGE, was 19.05c.

Tin.—The feature of this market has been the low point to which spot Straits has declined, it having reached 50c., New York, on May 26. Despite the fact that prices of all grades are low, consumers seem to be discouraged because of the interference with their business by the transportation conditions throughout the country and they have no ambition to buy. The same sentiment has prevailed among dealers. The market has been rather quiet and transactions small in volume. On Tuesday, May 25, about 75 tons of spot Straits sold at 50c. per lb. and on Wednesday about 10 tons at the same figure, with 50 tons for June delivery at 49c. On Thursday about 25 tons of spot Straits was sold at 51.50c. and on Friday about 25 tons of Banca for June-July shipment at 50c. Late on Thursday, May, 27, there were a few transactions in future shipment from the East, mostly among dealers, at prices ranging from 50.75c. to 51.25c. The quotation for spot Straits tin to-day is 51.50c., New York, and the same position in London is quoted at £287 5s. per ton, which contrasts with £289 a week ago. Arrivals up to May 26, exclusive, have been 6230 tons, with 1365 tons reported afloat.

Lead.—This market has been quiet and quotations are unchanged in the outside market at 8.15c., St. Louis, or 8.50c., New York, with the price of the leading interest still maintained at 8.25c., St. Louis, or 8.50c., New York. Spot lead is commanding a premium and has sold at 9.37½c., New York, at which figure it can still be obtained, but there is no urgent demand. Deliveries are better from the West, but buyers do not appear to be anxious to enter the market.

Zinc.—There has been but little change in the lifeless condition of the market. Prime Western for delivery in June and into July is quoted to-day at 7.70c., St. Louis, or 8.05c., New York, which is a slight advance over a week ago. This is due not so much to an increased demand as to a slightly higher market in London and a stronger value for sterling exchange.

Another factor is the inauguration of labor troubles at the smelters in the West. For third quarter some producers are quoting about 7.75c., St. Louis, or 8.10c., New York. Demand on the whole, though, is very light, with neither sellers or consumers taking any particular interest.

Antimony.—The market is dull and lower at 8.87½c. for the lower grades and 9c. for the higher, duty paid, New York, for wholesale lots for early delivery.

Aluminum.—The market is unchanged, with the leading interest quoting 33c., New York, for virgin metal, 98 to 99 per cent pure, and other sellers asking 31.50c., New York. Wholesale lots for early delivery are involved in both cases.

St. Louis

May 31.—The non-ferrous markets have been quiet, but the metals have been in a little better supply. On car lots we quote: Lead, 9c. spelter, 8.50c. to 8.75c. In less than car lots the quotations are: Lead, 9.25c.; spelter, 9c.; tin, 64c.; copper, 20c.; antimony, 11c. In the Joplin district zinc blende was quoted at \$42.50, basis 60 per cent, with premium grades running up to \$45. Lead was sold at \$100 per ton, basis 80 per cent, and calamine was held at \$35 per ton, basis 40 per cent. On miscellaneous scrap metals we quote dealers' buying prices as follows: Zinc, 9c.; heavy yellow brass, 10.50c.; heavy red brass, 15c.; heavy copper and copper wire, 15.50c.; light copper, 13c.; pewter, 35c.; tin foil, 43c.; zinc, 4.50c.; lead, 6c.; tea lead, 3.50c.; aluminum, 24c.

The Engineering Convention at Washington

The conference of delegates representing the national, local, state and regional engineering organizations of this country, which convenes in Washington, D. C., on June 3-4, 1920, is the first meeting of the kind. It is the first attempt to bring about a solidarity in the profession through a federation of the engineering organizations in this country in a comprehensive organization dedicated to the city, state and nation. The joint conference committee representing the large national engineering societies issued a call to about 100 engineering organizations inviting them to send delegates to the conference. More than 60 organizations have signified their intention to participate and will be represented by more than 125 delegates, who will represent an aggregate membership of more than 100,000 engineers.

The primary purpose of the meeting is to effect the co-operation of the engineering and allied technical organizations of the country to further the public welfare wherever engineering training and technical knowledge are involved and to consider matters of common concern to these professions. The technical societies have an aggregate membership of upward of 150,000 engineers.

Ore Shortage Feared

Members of blast furnace departments of Mahoning and Shenango Valley plants and merchant producers anticipate curtailed metal and pig iron output this summer and next winter because of ore shortage. The coal and railroad strikes have greatly interfered with movement of ore from the Lake docks to the furnaces, with the result that ore stocks are being diminished. Ore shipments arriving at plants in this territory so far this season are almost exclusively from dock balances at the harbors carried over from last fall.

Such balances at the lakes last fall and stock piles at the furnaces were not up to their usual proportions. The rail strike has prevented the spring movement of ore to the stacks getting under way in anything like normal volume. Furnaces are far behind their normal ore reserves.

George W. Charlton, Atlas Crucible Steel Co., gave an address on the manufacture of tool and alloy steel which was illustrated with moving pictures before the Boston Branch, American Steel Treathers' Society, May 21, at the Franklin Union.

Prices Finished Iron and Steel, f.o.b. Pittsburgh

Freight rates from Pittsburgh on finished iron and steel products, with revisions effective from Jan. 1, 1920, in carload lots, to points named, per 100 lb., are as follows:

New York, 27c.; Philadelphia, 25c.; Boston, 29½c.; Buffalo, 21c.; Cleveland, 17c.; Cincinnati, 23½c.; Indianapolis, 24½c.; Chicago, 27c.; St. Louis, 34c.; Kansas City, 59c.; St. Paul, 49½c.; all in carloads, minimum 36,000 lb. To Denver the rate is 99c., minimum carload 40,000 lb.; Omaha, 59c., minimum carload 36,000 lb.; New Orleans, 38½c., minimum carload 36,000 lb.; Birmingham, 57½c., minimum carload 36,000 lb. To the Pacific Coast the rate is \$1.25 per 100 lb. on articles of iron and steel, minimum carloads 80,000 lb., while the structural steel rate is \$1.25, minimum carload 50,000 lb., or \$1.315, minimum carload 40,000 lb. The rate on ship plates, Pittsburgh to Pacific Coast, is \$1 per 100 lb., minimum carload 80,000 lb. On wrought iron and steel pipe, the rate from Pittsburgh to Kansas City is 56c., to St. Paul, 49½c.; to Denver, 99c.; to Omaha, 56c., all in carload lots, minimum 46,000 lb. To Jacksonville, Fla., all rail carloads, 41½c., minimum 36,000 lb., less than carloads, 59c.; rail and water, carloads 34½c., minimum 36,000 lb.; less than carloads 46½c. On iron and steel items not noted above, the rates vary somewhat, and are given in detail in the regular railroad tariffs.

Structural Material

I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zebs, structural size, 2.45c. to 4c.

Wire Products

Wire nails, \$3.25 to \$4 base per keg; galvanized, 1 in. and longer, including large-head barbed roofing nails, taking an advance over this price of \$1.50 and shorter than 1 in., \$2. Bright basic wire, \$3 to \$3.50 per 100 lb.; annealed fence wire, Nos. 6 to 9, \$3 to \$3.50; galvanized wire, \$3.70 to \$3.95; galvanized barbed wire and fence staples, \$4.10 to \$4.45; painted barbed wire, \$3.40 to \$3.75; polished fence staples, \$3.40 to \$4.50; cement-coated nails, per count keg, \$2.85 to \$3.75; these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven-wire fencing are 60 per cent off list for carload lots, 59 per cent for 1000-rod lots, and 58 per cent for small lots, f.o.b. Pittsburgh.

Bolts, Nuts and Rivets

Large structural and ship rivets.....\$4.50 base
Large boiler rivets.....4.60 base
Small rivets.....50 per cent off list
Small machine bolts, rolled threads,
40, 10 and 5 per cent off list
Same sizes in cut threads.....40 and 5 per cent off list
Longer and larger sizes of machine bolts,
30 and 10 per cent off list
Carriage bolts, ¾ in. x 6 in.:
Smaller and shorter, rolled threads, 40 and 5 per cent off list
Cut threads.....30 and 10 per cent off list
Longer and larger sizes.....30 per cent off list
Lag bolts.....50 per cent off list
Flow bolts, Nos. 1, 2 and 3 head.....40 per cent off list
Other style heads.....20 per cent extra
Machine bolts, c.p.c. and t. nuts ¾ in. x 4 in.:
Smaller and shorter.....35 per cent off list
Longer and larger sizes.....25 per cent off list
Hot pressed and cold pressed sq. or hex. blank nuts, 2c. off list
Tapped nuts.....\$1.75 off list
Semi-finished hex. nuts, U. S. S. and S. A. E.:
¾ in. and larger.....60 and 5 per cent off list
9/16-in. and smaller.....70 and 5 per cent off list
9/16-in. and smaller, A. L. A. M. or S. A. E.,
70, 10 and 5 per cent off list
Stove bolts in packages.....70 and 10 per cent off list
Stove bolts in bulk.....70, 10 and 2½ per cent off list
Tire bolts.....55 and 10 per cent off list
Track bolts.....6c. base
One cent per lb. extra for less than 200 kegs. Rivets in
100-lb. kegs 25c. extra.
All prices carry standard extras f.o.b. Pittsburgh.

Wire Rods

No. 5 common basic or Bessemer rods to domestic consumers, \$52 to \$70; chain rods, \$75 to \$80; screw rivet and bolt rods and other rods of that character, \$65 to \$70. Prices on high carbon rods are irregular. They range from \$75 to \$100, depending on carbons.

Railroad Spikes and Track Bolts

Railroad spikes, ½ to 9/16 in. and larger, \$4 per 100 lb. in lots of 200 kegs of 200 lb. each or more; spikes, ¾-in. and 7/16-in., \$4.25; 5/16-in., \$5; track bolts, \$4.90 to \$5. Boat and barge spikes, \$4.50 per 100 lb. in carload lots of 200 kegs or more, f.o.b. Pittsburgh. Tie plates, \$3 to \$4 per 100 lb.

Terne Plates

Prices of terne plates are as follows: 8-lb. coating, 200 lb., \$13.80 per package; 8-lb. coating, I. C., \$14.10; 12-lb. coating, I. C., \$15.80; 15-lb. coating, I. C., \$16.80; 20-lb. coating, I. C., \$18.05; 25-lb. coating, I. C., \$19.30; 30-lb. coating, I. C., \$20.30; 35-lb. coating, I. C., \$21.30; 40-lb. coating, I. C., \$22.30 per package, all f.o.b. Pittsburgh, freight added to point of delivery.

Iron and Steel Bars

Steel bars at 2.35c. to 4c. from mill. Common bar iron, 4.50c.

Wrought Pipe

The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe applying as from Jan. 14, 1920, and on iron pipe from Jan. 7, 1920:

Butt Weld

Steel		Iron	
Inches.	Black Galv.	Inches.	Black Galv.
1/8, 1/4 and 3/8...	47	1/8 and 1/4.....	1 +25
1/2.....	51	3/8.....	25 1/2 + 1 1/2
3/4 to 3.....	54	1/2.....	29 1/2 + 1 1/2
		3/4 to 1 1/2.....	34 1/2 18 1/2
		2 and 2 1/2.....	33 1/2 17 1/2
Lap Weld		Lap Weld	
2.....	47	1 1/2.....	24 1/2 9 1/2
2 1/2 to 6.....	50	1 1/2.....	31 1/2 17 1/2
7 to 12.....	47	2.....	28 1/2 14 1/2
13 and 14.....	37 1/2	2 1/2 to 6.....	30 1/2 17 1/2
15.....	35	7 to 12.....	27 1/2 14 1/2

Butt Weld, extra strong, plain ends

1/8, 1/4 and 3/8...	43	3/4.....	+7 +40
1/2.....	48	3/8.....	23 1/2 6 1/2
3/4 to 1 1/2.....	52	1/2.....	29 1/2 15 1/2
2 to 3.....	53	3/4 to 1 1/2.....	34 1/2 19 1/2
		2 and 2 1/2.....	34 1/2 19 1/2

Lap Weld, extra strong, plain ends

2.....	45	1 1/2.....	27 1/2 13 1/2
2 1/2 to 4.....	48	2.....	29 1/2 16 1/2
4 1/2 to 6.....	47	2 1/2 to 4.....	31 1/2 19 1/2
7 to 8.....	43	4 1/2 to 6.....	30 1/2 18 1/2
9 to 12.....	38	7 to 8.....	22 1/2 10 1/2
1 1/4.....	21 1/2	9 to 12.....	17 1/2 5 1/2

To the large jobbing trade an additional 5 per cent is allowed over the above discounts, which are subject to the usual variations in weight of 5 per cent.

On butt and lap weld sizes of black iron pipe, discounts for less than carload lots to jobbers have been seven (7) points lower (higher price) than carload lots and on butt and lap weld galvanized iron pipes have been nine (9) points lower (higher price).

Boiler Tubes

The following are the prices for carload lots f.o.b. Pittsburgh:

Lap Welded Steel	Charcoal Iron
3 1/2 to 4 1/2 in.....	1 1/4 and 1 1/2 in..... +20
2 1/2 to 3 1/4 in.....	2 and 2 1/2 in..... +10
2 1/4 in.....	2 1/2 and 2 3/4 in..... +1
1 3/4 to 2 in.....	3 and 3 1/4 in..... — 1 1/2
	3 1/2, 4 and 4 1/2 in..... — 3

Standard Commercial Seamless—Cold Drawn or Hot Rolled

Per Net Ton	Per Net Ton
1 in.....\$327	1 1/4 in.....\$207
1 1/4 in.....267	2 to 2 1/2 in.....177
1 3/4 in.....257	2 1/2 to 3 1/4 in.....167
1 1/2 in.....207	4 in.....187
	4 1/2 to 5 in.....207

These prices do not apply to special specifications for locomotive tubes nor to special specifications for tubes for the Navy Department, which will be subject to special negotiations.

Sheets

Prices of the Steel Corporation for mill shipments on sheets of United States standard gage in carloads and larger lots for indefinite delivery are given in the left-hand column. For reasonably prompt delivery, mills have no trouble in getting prices quoted in the right-hand column, or even higher prices.

Blue Annealed—Bessemer

	Cents per lb.
No. 8 and heavier.....	3.50 to 5.95
Nos. 9 and 10 (base).....	3.55 to 6.00
Nos. 11 and 12.....	3.60 to 6.05
Nos. 13 and 14.....	3.65 to 6.10
Nos. 15 and 16.....	3.75 to 6.20

Box Annealed, One Pass Cold Rolled—Bessemer

Nos. 17 to 21.....	4.15 to 6.30
Nos. 22 to 24.....	4.20 to 6.35
Nos. 25 and 26.....	4.25 to 6.40
No. 27.....	4.30 to 6.45
No. 28 (base).....	4.35 to 6.50
No. 29.....	4.45 to 6.60
No. 30.....	4.55 to 6.70

Galvanized Black Sheet Gage—Bessemer

Nos. 10 and 11.....	4.70 to 7.50
Nos. 12 to 14.....	4.80 to 7.60
Nos. 15 and 16.....	4.95 to 7.75
Nos. 17 to 21.....	5.10 to 7.90
Nos. 22 to 24.....	5.25 to 8.05
Nos. 25 and 26.....	5.40 to 8.20
No. 27.....	5.55 to 8.35
No. 28 (base).....	5.70 to 8.50
No. 29.....	5.95 to 8.75
No. 30.....	6.20 to 9.00

Tin-Mill Black Plate—Bessemer

Nos. 15 and 16.....	4.15 to 6.15
Nos. 17 to 21.....	4.20 to 6.20
Nos. 22 to 24.....	4.25 to 6.25
Nos. 25 to 27.....	4.30 to 6.30
No. 28 (base).....	4.35 to 6.35
No. 29.....	4.40 to 6.40
No. 30.....	4.40 to 6.40
Nos. 30 1/2 and 31.....	4.45 to 6.45

PERSONAL

Capt. Reginald W. Belknap, formerly in command of the battleship Delaware, has been assigned to the command of the Squantum destroyer plant, and Government dry dock, South Boston.

F. J. Foley, general sales agent, and E. McCormick, assistant to the president of the Railway Steel Spring Co., have been elected vice-presidents of the company.

P. B. Cowell, formerly with the Moore Drop Forging Co. and the Stevens-Duryea Co., Springfield, Mass., has become associated with Harold A. Wright, Boston, machine tools, as Connecticut representative, with headquarters at Bridgeport. Mr. Cowell will specialize in precision truing tools and air chucks.

H. A. Baxter, metallurgical engineer Tacony Steel Co., Philadelphia, has been appointed metallurgical engineer of the Penn Seaboard Steel Corporation. He is a graduate in the chemical engineering course of the University of Michigan, class of 1909. After two years as metallurgical engineer for the H. H. Franklin Mfg. Co., Syracuse, N. Y., Mr. Baxter became associated with the Midvale Steel Co., Philadelphia, as sales engineer. In 1915 he was made assistant superintendent of Midvale's Ordnance treatment department and subsequently was appointed superintendent of this department. In the fall of 1917 he resigned from Midvale to become the metallurgical engineer of the Tacony Ordnance Corporation, which in August, 1919, consolidated with the Tacony Steel Co. Mr. Baxter is a member of the Iron and Steel Institute of London, the American Society for Testing Materials, the American Institute of Metallurgical and Mining Engineers, the Society of Automotive Engineers, the American Society of Steel Treating and the Army Ordnance Association.

Frank G. Bitzer, foreman Millers Falls Co., Millers Falls, Mass., augers, etc., has been made superintendent of the Brattleboro, Vt., plant recently taken over by the company.

Clyde E. Dickey, president the Dickey Steel Co., Inc., New York, has been elected first vice-president and general manager of the Hammond Steel Co., Inc., Syracuse, N. Y., manufacturer of high grade alloy and carbon tool steels. Mr. Dickey has been in the steel business for 20 years.

Otto Bersch and Jack Stroman will represent the Chicago Flexible Shaft Co. in the new St. Louis office in the Railway Exchange Building. Mr. Bersch was for many years with the Brown Instrument Co. Both Mr. Bersch and Mr. Stroman are metallurgical engineers.

Bauschke Machinery Co., distributor for metal working machines, has opened up offices and display rooms at 1034 St. Clair Avenue, N. E., Cleveland. Mr. Bauschke was former Ohio representative for Kearney & Trecker Co. E. W. Kenyon, former Ohio representative for the W. F. Davis Machine Tool Co., and C. B. Harding, former eastern representative for the Lees-Bradner Co., are associated with Mr. Bauschke in his new enterprise.

G. Jeffery, formerly salesman with the J. I. Case Plow Works, Racine, Wis., and working out of the St. Louis office, who recently has been with the Pennsylvania Railroad at Altoona, Pa., as power plant construction engineer, has severed his connections with the latter and is now with the Machine Tool Engineering Co., 149 Broadway, Singer Building, New York, as special sales representative.

At the annual meeting of the New England Iron League, May 20, Harry O. Russ, the Eastern Steel Co., was elected dictator. Charles H. Carter, Midvale Steel Co., was appointed treasurer, and Harry W. Fitts, New England Structural Co., secretary, for the ensuing term.

E. F. Parks, general superintendent, Universal Winding Co., Providence, R. I., is on a trip abroad. He will be gone about two months.

On May 12, the Emperor of Japan decorated with the Order of the Rising Sun, E. M. Herr of Pittsburgh, president Westinghouse Electric & Mfg. Co., and L. A. Osborne of New York, president Westinghouse Electric International Co. These American manufacturers have been several months in Japan studying Oriental industrial conditions. The companies which they represent have always had close relations with Japan, and have supplied that country with a great deal of power machinery. They have also undertaken the training of a number of Japanese students at their different works. The Order of the Rising Sun is the highest honor the Emperor can bestow. Mr. Herr received the third class, Mr. Osborne the fourth, the higher classes being awarded only to Japanese national heroes.

Robert F. Herrick has resigned as president of the Reed-Prentice Co., Worcester, Mass., machine tools. He is succeeded by Arthur H. Weed, Boston. No other change in officers has been made. Mr. Herrick's resignation was due entirely to the pressure of other business interests. He still retains his stock interest in the Reed-Prentice Co. Mr. Weed is a law partner of Mr. Herrick, with offices in Boston. He says there will be no change in the business policy of Reed-Prentice Co. Mr. Herrick will sail for Europe this week.

William T. Lewis has been appointed superintendent of mills of the Liberty Works of the Trumbull Steel Co., near Leavittsburg Ohio. He has been hot mill foreman of the Farrell, Pa., plant of the American Sheet & Tin Plate Co.

Robert W. McCleary, formerly with the rolls department, Mesta Machine Co., Pittsburgh, recently resigned to become manager of the Massachusetts Iron & Steel Co., Danvers, Mass.

B. F. Brusstar has resigned as general manager of the Cleveland Brass & Copper Mills, Inc., Cleveland, and has been succeeded by B. M. Gardner who will also continue in his former capacity as secretary.

H. R. Feldstein, formerly assistant manager, Carnegie, Pa., works of McClintic-Marshall Co., and R. M. Collins, formerly with the sales department of McClintic-Marshall Steel Supply Co., have taken over the Reliance Boiler Works in the Woods Run district, at Pittsburgh and will operate the plant under its present name.

Harold B. Buse, formerly with the Geometric Tool Co., New Haven, Conn., has become associated with Hill, Clarke & Co., Inc., Boston, machine tools. Mr. Buse will make his headquarters at New Haven, and will be associated with F. M. Lord in the Connecticut field.

William M. Henderson, who during the latter part of the war was production engineer, Wright-Martin plants, Long Island City and New Brunswick, N. S., and who after the war was connected with the International Time Recording Co., Endicott, N. Y., is now in the suggestion department, General Electric Co., West Lynn, Mass.

R. K. Blanchard, engineer, Neptune Meter Co., New York, has returned from a three months trip to Europe, partly in relation to the French meter plant of the company.

Frank W. Stone has been appointed manager of sales for all territory covered by the Atlanta, Ga., district office of Midvale Steel & Ordnance Co., Philadelphia.

Lieut. Jean Jean, who was in the United States some months ago in connection with purchases of machine tools for the Construction Metallique of Belgium, has returned to this country. He is now located in the Machine Tool Section, Office of the Director of Sales of the War Department, room 2504, Munitions Building, Washington. He is on a special mission for the Belgium Government and is not making purchases of machine tools.

C. D. Gilpin has been appointed works manager of the Detroit plants of the Aluminum Manufacturers, Inc. He started with the company eight years ago as a timekeeper.

John Gillen, who has represented the Standard Gauge Steel Co. in the Western territory for many years, with headquarters at Chicago, has terminated his connection with that company and will take a short vacation before making new connections.

C. A. Croteau, Wood Hydraulic Hoist & Body Co., Detroit, has gone to Cleveland to join the Truck Engineering Co., that city. He will have charge of one of the branch plants of the Truck Engineering Co.

F. F. Beall has been elected president of the Gray Motor Co., Detroit. He was formerly vice-president in charge of manufacturing of the Packard Motor Car Co., Detroit.

Benjamin A. Dempsey, works manager Werra Aluminum Foundry Co., Waukesha, Wis., has resigned.

A. F. Anjesky for two and a half years sales representative for the Allen-Bradley Co., Milwaukee, Wis., has been appointed New York district sales representative of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. Mr. Anjesky has been with the Cleveland company for the past six months.

Muncie Machinery & Supply Co., Muncie, Ind., has made the following additions to its organization: A. F. Baur, formerly of the Baur Gas & Supply Co., Eaton, Ind., has been placed in charge of the pipe department; H. D. Weed, formerly purchasing agent Ball Bros. Co., Muncie, Ind., will handle various items through the salvage department, of which he has assumed charge; A. F. Ennis, formerly secretary of the War Department Salvage Board at Cleveland has been placed in charge of the steel sales department. The company is building an addition to its office building in Muncie, and is looking for a favorable location for a warehouse in Chicago.

R. J. Schuler, director of purchase Detroit Gear & Machine Co., has resigned to take up active duties with the International Purchasing & Engineering Co., with executive offices at 1558 Penobscot Building, Detroit. This company's business is to do purchasing and give engineering services to foreign and domestic manufacturers. J. E. Ryan, formerly director of purchases for the Russel Motor Axle Co., and Mr. Schuler will be in charge of the Detroit and New York offices, and they expect by August to announce who will have charge of the European office, which will be located in London.

W. S. Pilling of the pig iron firm of Pilling & Crane, Philadelphia, and his son, G. P. Pilling, Philadelphia representative of Freyn, Brassert & Co., blast furnace builders and operators, will sail June 5 for Europe. They will study business conditions abroad and will return in August. G. P. Pilling has been retained by the E. & G. Brooke Iron Co., Birdsboro, Pa., as consulting furnace operator.

Frederick Clements and Harold Royston, of the Park Gate Iron Works, Rotherham, Yorkshire, England, are in the United States visiting iron and steel works, making a special study of the sintering of fine iron ores. They attended the meeting of the American Iron and Steel Institute in New York last week as the guests of C. P. Perin.

Albert Broden, who has long been a considerable factor in the importation of Swedish ores for eastern Pennsylvania furnaces, sails for Sweden this month.

Chester A. Orr is now vice-president Cromwell Steel Co., Lorain, Ohio. He is in charge of operations at that plant. Mr. Orr is a graduate of the Case School of Applied Science, Cleveland, and was formerly superintendent of the Central blast furnace plant of the American Steel & Wire Co., Cleveland.

The United States Radiator Corporation, general offices at Detroit, has completed a one-story addition to its plant at West Newton, Pa., at a cost of about \$50,000, and the equipment needed for this addition has been purchased.

Dwight P. Robinson & Co., Inc., New York, has moved from 61 Broadway to 125 East Forty-sixth Street, New York, and has consolidated with Westinghouse, Church, Kerr & Co., Inc., foundries, shops, power developments and industrial plants complete.

OBITUARY

EDMUND GYBBON SPILSBURY, mining and metallurgical engineer of note, president E. G. Spilsbury Engineering Co. and former president of both the Engineers' Club of New York and the American Institute of Mining and Metallurgical Engineers, died suddenly May 28 of heart failure in the New York Eye and Ear Infirmary following an operation for cataract a few days before. He was 75 years old, having been born in London in 1845. He went to school in Liege, Belgium and in 1862 was graduated from the University of Louvain. Until 1870 he was identified with work on the continent, chiefly for the Eschweiler Co. of Stolberg. He came to the United States to investigate the supply of lead and zinc, and after carrying on investigations for two years decided to remain. He was manager of the Trenton Iron Co. from 1888 to 1897. He wrote many articles for technical journals and was a member of many scientific societies. He lived at the Mansion House, Brooklyn.

AUGUST A. VILSACK, aged 44, chairman Washington Tin Plate Co., Washington, Pa., died on Thursday, May 27 at his home in the East End, Pittsburgh. He acquired his education in the parochial schools, and at Canisius College, Buffalo, N. Y., and at St. Mary's College, Emmitsburg, Md., graduating from the latter institution in 1896. His early business training was gained with the Pennsylvania National Bank, with which institution he was associated five years, after which he went to the German National Bank, where he rose to the position of cashier. He later engaged in the tin plate business and a few years ago was made chairman of the Washington Tin Plate Co. He was a member of the Pittsburgh Athletic Club, the Pittsburgh Field Club, the Lincoln Club and the Elks.

JOHN W. SUETTERLE, president the Loeffelholz Co., brass founder, and vice-president Milwaukee Malleable & Gray Iron Co., died at his home in Milwaukee on May 25 at the age of 71 years. He belonged to one of the earliest families to settle in Milwaukee. He also served as vice-president Milwaukee Hay Tool Co. and numerous other industries.

JOHN SCULLIN, railroad builder, steel manufacturer and bank director, died of uremic poisoning at St. Luke's Hospital in St. Louis May 28. He was 84 years old. He was chairman of the board of directors of the Scullin Steel Co. and also a director in a number of St. Louis banks.

WILLIAM E. THOMAS, Atlantic Machine Screw Co., South Boston, died May 25, at Watertown, Mass., aged 69, from hardening of the arteries. He was born in Holland, Me., and went to Boston more than 50 years ago, where he soon established the Machine Screw Co.

CHARLES H. KENNEDY, for 20 years superintendent in the puddling department of the Carnegie Steel Co., died May 19 at his home in Los Angeles, Cal. He served the Carnegie company in the Youngstown and Pittsburgh districts. Mr. Kennedy had been retired for 10 years.

CHARLES E. KIMBALL, senior member of Charles E. Kimball & Son, Boston, machinery and hoisting equipment, died recently at his home in Wakefield, Mass. He was a native of Lynn, Mass., the son of the late Charles E. and Mary Kimball.

Two additional sheet mills will be started July 1 by the Newton Steel Co. at its plant in Newton Falls, Ohio., which will give the company 10 active units producing high-grade sheets. The new units are practically completed, but their operation is held up until an adequate supply of sheet bars is stocked.

A lathe set made especially for garages is a recent product of the Ready Tool Co., Bridgeport, Conn. It includes tools for turning outside and inside, threading outside and inside, cutting off, etc.

SLOW SHIPMENTS

Production at Youngstown Improves, But Movement from Plants Lags

YOUNGSTOWN, Ohio, June 1—Leading iron and steel producers announce further accessions to operating schedules as the railroad strike is slowly clearing up. With 13 of 25 blast furnaces in the Mahoning Valley pouring, the number of active stacks has passed the 50 per cent mark, and indications are that more blasts will be turned on this week. The Brier Hill Steel Co. planned to start its Jeanette furnace, which would make all three of its furnaces active. The Youngstown Sheet & Tube Co. has started two furnaces in the East Youngstown battery and simultaneously put another group of 51 by-product coke ovens in commission, giving it 153 active ovens, out of 306.

For the first time since the railroad strike started, the Sharon Steel Hoop Co. is operating its open-hearth works and bar mills at Lowelville.

The Republic Iron & Steel Co. has added two tube mills to the active finishing units, and is operating, in addition, two blast furnaces, 13 open hearths, the Bessemer plant, plate mill and four mills of the Brown-Bonnell works.

Finishing units are gradually being put in operation by the Carnegie Steel Co., which is operating three blast furnaces at the Ohio works, three mills at the McDonald plant, four units at the Upper and two at the Lower Union mills, and the 43-in. mill at the Ohio Works. The open-hearth plant of 15 furnaces was idle two weeks.

The Youngstown Sheet & Tube Co. is operating four of its blast furnaces and half of its open hearth complement with its finishing units on the same basis.

The Trumbull Steel Co. is approaching normal schedules at its Trumbull and Liberty plants in Trumbull county. This week its open-hearth plant is on in full, while the bloom and bar mills, 21 sheet and tin mills at the Trumbull works, jobbing mill, and hot and cold-strip steel units are active. All of the 10 tinplate mills at the Liberty plant are producing.

Overcoming Difficulties

This resumption indicates that the railroads are overcoming their operating difficulties, although the process is a slow one and iron and steel production is still far below normal in the Mahoning and Shenango Valleys. Even should the carriers resume pre-strike operations within a short period, it would be a month at least before the steel industry could get on its feet again. First of all, accumulated finished product must be moved and railroad operating executives have appealed to the American Railway Association for empty box cars, which are sorely needed.

At the end of last week, plant operation as reported to the operating committee of the Youngstown district for transmission to the Interstate Commerce Commission revealed the following percentages: Youngstown Sheet & Tube Co., 50 per cent; Republic Iron & Steel Co., 30 per cent; Sharon Steel Hoop Co., 15 per cent; Trumbull Steel Co., 75 per cent; Ohio Works, Carnegie Steel Co., 60 per cent; Brier Hill Steel Co., 50 per cent; American Sheet & Tin Plate Co., at Sharon and Farrell plants, 80 per cent, and Valley Mould & Iron Corporation at Sharpsville, 75 per cent.

The discrepancies are due to unequal distribution of fuel. On the whole, the figures show the district operating at about 50 per cent and there is some improvement this week.

An indication of railroad conditions is found in the fact that on May 28, 99 road crews of 169 were working in the Youngstown district; 107 of 279 switching crews; and 22 of 92 crews working within the plants.

Shortage of Cars

In addition to the lack of crews, shortage of cars of all kinds is proving a handicap to restoration of normal conditions. It is reported that nearly 1500 bad order cars are marooned in this territory.

Open-hearth furnaces in the district are producing

at the rate of 60 per cent of normal. All Bessemer plants are blowing steel.

Last week the Youngstown Sheet & Tube Co. received the first consignment of coal from its new mines at Nemacolin, Pa., which was shipped by rail. The mines are producing at the rate of 1000 tons a day. Delay in completing a five and one-half mile spur from the property to the main line of the Pennsylvania Railroad compelled the company to sell most of the output to date on the open market, shipping the coal on barges down the Monongahela river. Capacity of the mines will be steadily increased until they are fully able to meet the corporation's fuel requirements.

Traffic experts estimate the district needs 5000 mill type gondola cars and 600 box cars to meet its requirements. Against this need, there were available on May 28, 96 gondolas and but 65 box cars. On the other hand, the district is jammed with empty coal cars, emphasizing the fact that the railroads have by no means overcome their operating difficulties. Last week 1368 empties were clogging sidings.

Figures furnished by the industries disclose that while the average operation of the plants is above half normal, shipping of finished materials is less than 20 per cent and that yards and warehouses are still filled.

Poor Switching Service

Reports of the railroads show that while road service is almost normal, with the equipment on hand, switching service is only about 45 per cent of normal. Most of this work is being done by newly assembled crews, railroaders being imported from other centers and new men being constantly hired.

Diversion of box cars for other needs is given by traffic departments as one reason for the wholly inadequate supply of this type. Increased shortage in cars of this description is traced to the recent order of the Interstate Commerce Commission requiring the delivery of box cars to roads west of Chicago and the Mississippi for movement of grain. Coming on the heels of a substantial shortage, this promulgation will result in further reducing the supply of cars needed to ship finished steel products that require protection in transit, such as sheets and plates.

Pipe production in the Valley is still far below normal, as indicated in the idleness of the tube department of the Republic Iron & Steel Co. for seven weeks. The company enters June with one-third of its capacity in production. The Youngstown Sheet & Tube Co. has been enabled to make shipments of pipe in train lots. On May 29 a train of oil country pipe destined for the Southwest left the East Youngstown plant.

All rail operation in the district is under the direction of a joint terminal committee, the proceeding closely resembling Federal control. It is based on Section No. 402 of the transportation act, which gives a wide range of power to the Interstate Commerce Commission to act in case of national emergency in conducting the country's carriers.

Sheet makers are contenting themselves with supplying the regular trade and are out of the market otherwise. Much first half-tonnage will be carried over to the second half. Much of the black tonnage now being rolled was placed at 5c. Dealers and jobbers have no difficulty in disposing of stocks and are frequently able to get odd-lot rollings from the makers, especially in smaller quantities. This stock they are enabled to market at prices much higher than those at which the producers are supplying their regular customers, all of which, of course, is per contract. Consumers continue to come direct to the mills in search of material and regular buyers make trips at frequent intervals to inquire about their allocations and make sure that they will receive their proportion of the output, if at all possible. In the past seven weeks, however, makers have paid more attention to getting shipments out than to making equitable allocations, which were rendered difficult by the rail situation.

In view of diminished finished production, buyers of sheet bars have found their needs well filled and have no complaint on this score.

Makers say that output of finished steel for May in the district will be the lowest of any month this year.

PRODUCTION TROUBLES

Canadian Industries Seriously Crippled by Steel Shortage

TORONTO, ONT., June 1.—Production difficulties that are now being encountered by the steel industry in Ontario are more serious than have been known by steel men for the past 20 or 30 years. The situation at the plant of the Steel Co. of Canada, Hamilton, Ont., has been outlined by Robert Hobson, president of the company. He stated that insufficient supplies of coal have been the greatest handicap to production. The East End plant is operating considerably below capacity and some departments can be run only intermittently. Consumers of steel of all kinds are anxious to get iron and steel in order to keep their plants in operation; to such as are impatient to get deliveries, it is noteworthy that the steel mills are also operating under great difficulties. Mr. Hobson stated that only one blast furnace is blowing, and that whereas the repairs on the second furnace will probably be completed between the middle of June and July, it will not be possible to put it in blast until the coal situation has improved very materially. Of the 80 by-product coke ovens, only 30 are in operation at present on account of the non-arrival of sufficient coal. The amount of fuel coming

forward is approximately 400 tons a day, or one-fifth of the normal shipments. The only method by which deliveries can be secured is to get entire trains routed through. As an instance of the delays in production caused by the demoralization of transportation in the United States, Mr. Hobson said that a car of brass castings could not be secured from Pittsburgh in spite of all efforts to get the car moving. Somewhat less than two-thirds of the normal working force is being employed at the company's plant, according to the president. As an instance of the loss in economy and efficiency, it is necessary to divert the gas from the coke ovens that ordinarily goes to the steel furnaces. While the labor problem is still prominent, it takes second place to the fuel shortage. A conference was arranged between the striking engineers and the company by Senator Gideon Robertson, Federal Minister of Labor, and an understanding was reached by the company's executives and the strikers' committee. The company propose to take the men back in order of seniority as soon as the coal supply becomes more plentiful and additional parts of the plant can be restarted. Meanwhile the production situation is serious—more so than for several years—and no immediate relief is in sight. United States steel manufacturers are not the only ones having production difficulties, therefore.

Steel Concerns May Merge

Plans are under way for the merger of all the interests of the Wheeling Steel & Iron Co., the Whitaker-Glessner Co., Wheeling W. Va., and the La Belle Iron Works, Steubenville, Ohio, into one company. Some preliminary work has been done and a committee of three from each company has been appointed by the stockholders of each of the interests involved, to represent their interests. As yet nothing definite has been done as a very large amount of data will have to be gathered by the committee relative to each company, before much progress can be made looking to the final merger. One plan proposed is to have the Whitaker-Glessner Co. absorb the Wheeling Steel & Iron Co. and the La Belle Iron Works, but this will likely be strongly opposed. Alexander Glass, president of the Whitaker-Glessner Co., and Isaac M. Scott, president of the Wheeling Steel & Iron Co., are reported as favoring the merger, and have indicated their intention to retire from active management of the consolidated interests if the deal goes through. The La Belle Iron Works is one of the oldest iron and steel concerns in the Wheeling district, and has been a very successful company. The concern operates two blast furnaces, open-hearth steel plant, pipe, tube and sheet mills, at Steubenville, Ohio, also a steel cut nail factory at Wheeling, W. Va., and has a large Koppers by-product coke plant just across the Ohio River at Steubenville, which furnishes coke for its two blast furnaces, which is taken across the river on its own steel bridge. The company has paid for some years dividends of 6 per cent on its common stock and 8 per cent on its preferred stock.

The Wheeling Steel & Iron Co. is also very old, being a consolidation, many years ago, of three or four steel companies in the Wheeling district. The company has three blast furnaces, Bessemer steel works, plate, skelp and pipe mills at Wheeling, also operates a very large tin plate mill at Yorkville, Ohio. It has paid dividends of 8 per cent on its preferred stock for some years.

The Whitaker-Glessner Co. is a large producer of sheets and of roof forms, and has a large plant in the Wheeling district, also blast furnaces and open-hearth steel works at Portsmouth, Ohio, formerly operated by the Portsmouth Steel Co., which the Whitaker-Glessner Co. absorbed a few years ago.

Whether the proposed merger of these three interests will be effected is not known at this time, but it is said the project looks favorable for being put through. In the past few years several attempts were made to consolidate the La Belle Iron Works and the Wheeling Steel & Iron Co., but something always came up to prevent the merger from being effected. Should

this merger be made it would form a very large steel company with a varied line of steel products. R. C. Kirk now president of La Belle Iron Works, is strongly talked of as president of the new consolidated interest, should it be formed.

A meeting of the stockholders of the Wheeling Steel & Iron Co. will be held in a short time to take action on a proposed large increase in its capital stock, likely to double it. It is also expected that at this meeting the company will declare a stock dividend.

Gray Iron and Steel Castings Companies Combine

Plans for the consolidation of the Interstate Foundry Co., and the Standard Steel Casting Co., Cleveland, and the Standard Steel Casting Co., Clearing, Ill., have been approved by the directors of the respective companies and will be acted upon at a special meeting of the stockholders June 1. The Interstate Foundry Co. will be reorganized and will purchase the two steel casting plants, payment for which will be made in stock of the reorganized company. The present owners of the Standard Steel Casting Co. acquired control of the Illinois foundry two years ago. Under the plans, F. B. Whitlock, manager of the Interstate Foundry Co., and president of the Standard Steel Casting Co., will be general manager of the three foundries. The Interstate Foundry Co. operates the gray iron foundry and its product goes largely into the automobile field. Under the reorganization plans 75,000 shares of no par value common stock and 4000 shares of 6 per cent cumulative preferred stock, \$50 par value, will be issued. Present stockholders will receive stock in the new company.

Building Rerolling Plant

The Cambridge Steel Co., Cambridge, Ohio, has under erection a rerolling steel plant for the manufacture of steel bars and agricultural sections out of old rails. The plant will include a main mill plant 125 x 350 ft. in which will be installed a 14-in. x 16-in. bar mill. The plan is being erected on the site of the plant of the Cambridge Rolling Mill Co., which was burned a few years ago. T. W. Scott, who was president of that company, is president of the new company. H. A. Forsythe is vice-president, O. O. Bell is general manager and W. N. Verner is secretary and treasurer. Mr. Bell was general manager and Mr. Verner auditor of the Marion, Ohio, rerolling steel plant of the Interstated Iron & Steel Co., which was sold a few months ago to the Pollak Steel Co.

What Is Needed to Stabilize Compensation Rates

Increasing Rates for Workmen's Compensation Insurance Have Driven Forging Makers in Ohio to Organize

BY DR. H. D. MARTIN*

MANUFACTURERS as a whole, especially the executive heads, do not pay the attention that they should to matters concerning the operation of the Ohio workmen's compensation act; and it was not until the significance of the situation was clearly defined by the Pollack Steel Co., Cincinnati, that the operators commenced to realize what really had taken place.

The issue which confronted the heavy steam forgers of Ohio with respect to the workmen's compensation act was emphasized in December, 1919. Seemingly the importance of it did not receive the proper recognition, as it was only by the most persistent efforts that a meeting of heavy steam forge operators was held in April in Columbus. At this meeting a preliminary discussion took place on the advisability of forming an organization, and adjournment was made until May 11, in Cleveland, at which time a permanent organization was effected. A chairman and secretary were appointed and arrangements made to meet at regular intervals to study causes, frequency and nature of accidents characteristic of the industry and their prevention.

The Large Advance in Compensation Rates

In 1913, the basic or manual compensation insurance rate was 95 cents per \$100 payroll expenditure, and to-day it is \$3.75 per \$100 payroll expenditure—an advance of 294 per cent. It was July 1, 1919, that the rate was raised from \$2.95 to the present rate of \$3.75, or a fraction over 27 per cent increase. Now, this affected all heavy steam forge operators in the State of Ohio and surely it is not very hard to deduce from this—using one's own payroll as a basis—how much it increased operating expenditure.

Quite naturally, we are interested in the "why" of the raise. It has been said that at the inception of the workmen's compensation in the United States reliable data upon which to base rate-making were not available, which fact resulted in the necessity of quoting high rates. The rate history reveals that due to a collection of circumstances they were reduced, which indeed was welcomed by all. The low rates were only short-lived. A new and more varied collection of circumstances, which were produced by experience, automatically caused the pendulum to swing in the other direction.

The history of state funds, specifically on the subject of rates, has closely paralleled that of private insurance companies. Among the reasons which constituted the basis of the last increase we find the collective accident experience developed by the operators plus an anticipated increase of the severity as well as the frequency of accidents due to the war—founded in all likelihood upon the fact that the ranks of the artisans and laborers of industry were in many cases replaced with less experienced as well as inexperienced workers, some of whom were physically unfit and permanently disabled in some fashion.

However, nothing much is recalled about the abnormally high payroll expenditures during the period of the war. Doesn't it seem logical to believe that the premiums collected by the fund were proportionally increased and will be increased with the advancement of payroll expense? But the working force of industry has not kept pace, nor is it anything near parallel to the increase of payroll expenditure.

Group or Individual Rates

Let us focus our attention on these two classes. Some have said that they had a preferred rate. Now, through definition, a preferred rate, according to our opinion, is the same as a basic or manual rate. Moreover, discussions have indicated that group and individual rating were jointly enjoyed. Inasmuch as spe-

cific operations are classified into groups and rated according to the experience developed, where, then, can an individual rating system apply? However, it may be possible that such a combination of systems has been based upon what is known as a credit premium rating system, which became effective to apply on all renewals occurring on and after Jan. 1, 1920. This system was an important extension of the commission which puts a specific proposition to every subscriber of the Ohio State insurance fund—(explained in the "Manual of Rules and Rates," effective July 1, 1919), as follows:

Rule IX—A credit premium merit rating system is hereby created to be applicable to the industrial risks of the fund and is hereby made effective to apply on all renewals on and after Jan. 1, 1920, and will apply retroactively to the expired six months' insurance period.

If, on the adjustment, at the termination of the six months' insurance period, the individual cumulative compensation losses of the risk (inclusive of medical, hospital and funeral costs) when applied against its cumulative payroll, do not produce a ratio, equal to, or in excess of the ratio as specified in the basic compensation allowance and credit premium factor table for the classification or classifications with which its operations are identified, such risks shall be entitled to and shall receive a credit premium equal to 10 per cent of the difference, multiplied by the percentage which its actual payroll for the last six months bears to its cumulative payroll.

If the manufacturer, individually, should he have a good experience, and receives \$10 for every \$100 he saves the fund, and the other manufacturers in the same group produce an experience which warrants a collective increase of 27 per cent on a \$100 payroll expenditure, is this not sufficient to prove that we do not participate in an individual rating system?

Should a manufacturer, even under the present ruling, experience losses which will exceed his compensation allowance, he is subject, according to Rule VIII, to penalization; which is expressed in this fashion: "In the event the accident experience of an employer develops a ratio in excess of ten (10) injuries per \$100,000 payroll, a charge of 3 per cent shall be made against each injury in excess thereof; but in no given six months' insurance period shall the individual rate of an employer be more than 30 per cent in excess of the current, preferred manual rate." So, the maximum rate for heavy steam forge work is \$4.77.

Our interpretation of the situation has been fully outlined as to the "why" or reason for its existence. I believe that it will be generally agreed that it is much better to be adequately protected by a fund which is highly solvent, with an adequate reserve, than to have a low rate of premium and find that the fund is unable to meet its accrued obligations. But what is the equation of the whole situation? What can be done to relieve it? I believe that a way has been found, and I think that the manufacturers of Ohio, collectively, who are operating as state risks, have a marvelous opportunity, which evidently has not been realized.

Accident Prevention with Compensation Administration

It was said by Carl Hookstadt, in his discussion on the subject of "Tests of Efficiency of the Workmen's Compensation," that "probably the greatest weakness of compensation laws in the United States is the lack of correlation between compensation administration and accident prevention. Effective prevention of accidents depends largely upon their causes, frequency and nature." This I do not believe is true of Ohio, though

*The basic compensation allowance and credit premium factor table which applies to the heavy steam forge classification has a total allowance of \$3751, which is divided into two parts—one which is known as the compensation allowance and credit premium factor—defined, means losses exclusive of those fatal. This is \$2063. The other the fatal factor allowance—which does not include any other loss is \$1688. The compensation allowance is based upon \$100,000 payroll expenditure, whereas the premium is based upon a \$100 payroll expenditure. Now, this exhibit sets forth the fact that the employer shall receive a credit premium of \$10 for every \$100 he shall save the fund below the ratio of the compensation allowance prescribed for his operations.

*Medical director, Pollack Steel Co., Cincinnati.

the safety department is somewhat embarrassed by the negligence of the last Legislature to appropriate funds properly to carry on the accident prevention work in the state. However, the compensation administration seems to be most heartily in accord with the prevention of accidents in the state. Moreover, the department of factory inspection and the director of safety, as well as other departments, have pledged the forge operators their support.

As pointed out, the collective allowance for compensation as well as fatal losses will cause the rate-

making department to increase the rate automatically in order to keep the fund solvent. Therefore, the only alternative for any group of manufacturers working under such a system is to organize themselves as a group for the express purpose of conserving human life; and we confidently believe that within at least a year's time we shall experience such a decrease in the number of accidents reported that it will be perfectly safe to allow a reduction of the insurance rate, which will proportionally decrease the cost of forging operations.

SHIPPING PIG IRON

Many Difficulties Encountered in the Movement to New England Points

New England foundries, in many instances, are noticeably short of pig iron and for that reason sellers have been given most of their attention of late to getting contract iron from the furnace to the foundry. Some progress in this direction has been made and the supply situation is less acute as a result.

Alley & Page, Boston, pig iron, have been successful in getting Warwick iron through from the furnaces, which are 40 miles out of Philadelphia. W. T. Bennett, of that organization, personally visited the furnaces and on May 19 started a solid train containing 50 cars carrying 2145 tons of iron. The dead weight of cars and iron was 3375 tons and two large engines were necessary to move the train. The iron is due to arrive at a Massachusetts point within a day or so, from where it will be rerouted or hauled away in trucks to melters. A second train, containing slightly less cars than the first, was started from the furnaces May 25, most of this iron being consigned to one melter, a cotton mill machinery manufacturer. No part of these shipments is for resale, the iron to be applied to existing contracts based on prices, which on the present cost of production, represents a loss to the furnace.

Mr. Bennett says some eastern Pennsylvania furnaces are banked for lack of fuel and that unless the fuel supply situation improves within the near future, further bankings will result. The furnaces are paying \$15 a ton for spot coke and it takes \$20 worth of coke to make a ton of foundry iron, and the total cost of producing and marketing pig iron exceeds \$40 a ton, so that prices quoted by the furnaces are by no means excessive. Mr. Bennett made a thorough investigation of the transportation situation and found there is a roundabout way that iron can be shipped into New England via the Boston & Maine Railroad at a considerable advance over regular freights. The situation at the Mechanicsville terminal is gradually improving, he says.

W. J. Breen & Co., Boston, pig iron, have arranged to ship 5000 tons of southern pig to New England via water. The first lot, 1200 tons silicon 2.75 to 3.25, is coming by barge and is due to arrive this week, having started May 24 from the furnace. It will dock at Providence, R. I. The second barge load will dock at Bridgeport, Conn., if present plans carry. The bulk of the 5000 tons will be offered on the open market and Mr. Breen intends to continue the service if the first attempt is successful.

Government Examinations for Technical Men

The United States Civil Service Commission announces an open competitive examination for technical examiner for mineral and metal claims investigations at salaries ranging from \$3,300 to \$4,800. Applicants must have graduated from a mining engineering course and specialized in geology, mineralogy and mine economics and have had at least six years subsequent experience in metal and mineral mining operations, testing and construction work. Applicants should apply for form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington.

Another examination will be held for designing engineer, electrical and mechanical, or radio, at salaries

ranging from \$2,500 to \$3,000. Applicants must be familiar with drawing room organization and practice; also with shop practice, including machine shop, pattern shop, foundry die casting, punch press and stamping operation. Applicants should apply for form 2118, stating the title of the examination desired. Another examination will be held for radio draftsman.

American Company Building Plant in Japan

The Trucson Steel Co., Youngstown, Ohio, which is building a plant in Japan, is the first foreign company to manufacture any of its products in that country. For the past seven or eight years the company's shipments to Japan have varied from 10,000 to 15,000 tons of steel per year, chiefly bars, sheets, plates, special rolled sections and finished products, such as steel sash, metal lath, and pressed steel products.

Because of the excessive freight in shipping fabricated products and their bulk, and because of the heavy import duties into the country, the Trucson company decided to construct a factory in Japan. Accordingly a subsidiary company was formed whose stock is held by the parent company, the American Trading Co. of New York, a selling agency, and a number of Japanese employees. In the past the company has maintained a Japanese subsidiary, whose staff has consisted of about 100 men, 50 of them engineers. In the new factory between 400 and 500 men will be employed.

The Japanese plant is built along the most approved lines and is of fireproof construction. It is located on the outskirts of Yokohama and is intended to manufacture such products as metal lath, steel sash, hy-rib, expanded metal, steel buildings and material for reinforcing concrete.

Buildings now under construction are 250 ft. long and 120 ft. wide. They are built entirely of reinforced concrete. The trusses overhead as well as the runways for the cranes are of concrete, this type of construction being followed on account of the excessive cost of steel and the comparative cheapness of concrete.

From the Japanese factory the entire East is to be reached, and the factory will be in a commanding position to supply such needs.

It is pointed out that fireproof construction is being employed on a larger scale than ever before in Japan, and it is expected the plant will be kept busy from the outset.

R. S. Moss will direct the administrative staff of the Japanese plant. Men will be sent from the Youngstown offices to take charge of operations and selling.

The corporate name of the Macomber & Whyte Rope Co., Kenosha, Wis., has been changed to Macwhyte Co., effective June 1. No change in ownership, management, or policy of the company is involved. The products of the company have been known for several years and advertised under the trade name, "Macwhyte." The change, therefore, brings the name of the company into line with the name of the products, which include wire rope, streamline wire for airplanes, mine car hitchings, and safety detaching hocks for coal mines.

The National Association of Waste Material Dealers, Inc., will hold quarterly meetings at the Hotel Astor, New York, June 15, 16 and 17. The scrap iron division will meet at 10 a. m., June 17; the metals division at 2.30 p. m., June 15; the foreign trade division at 11.30 a. m., June 16.

Machinery Markets and News of the Works

MORE RAILROAD INQUIRY

Atlantic Coast Line Issues Big List

Otherwise the Machine Tools Markets Continue Quiet, Few Orders Being Placed

With the exception of prospective railroad buying, the machine-tool markets present a rather dull aspect, compared with the activity of only a few weeks ago.

Another large railroad list has been added to those already pending, the latest coming from the Atlantic Coast Line, whose purchasing offices are at Wilmington, N. C. It calls for approximately 150 shop tools of various kinds. No action has been taken by the Norfolk & Western and Chesapeake & Ohio toward placing

orders against the good-sized lists recently sent out by these roads. The New York Central is expected to issue a list soon. Some of the machines, for which this road inquired several weeks, ago, have not been bought.

Buying of tools by manufacturing plants has fallen to a very low point. Present inactivity is comparable to that which prevailed just before the war or directly following the armistice. Manufacturers are so uncertain as to how soon the freight congestion will be cleared up that they are hesitating about placing further business.

It is worth noting that there is no feeling of apprehension in the machine tool trade. On the contrary, many in the trade believe that a period of quiet, lasting for a few months, will have a most salutary effect on general conditions.

New York

NEW YORK, June 1

The Atlantic Coast Line has come into the market for about 150 miscellaneous machine tools, plate shop and forge shop equipment included. This is perhaps the largest railroad list that has been issued since the roads were returned to private operation. The recent lists of the Norfolk & Western and Chesapeake & Ohio are still pending, but it is expected that purchasing will be begun soon. The New York Central will probably issue a list of its shop requirements within the next two or three weeks. Inquiries for a few tools, which were sent out by this road several weeks ago, have not yet been acted upon. The Southern Pacific Railroad has practically closed for about \$200,000 worth of shop tools.

The West India Sugar Finance Corporation, 129 Front Street, New York, has issued a list of about 20 machines for machine shop, forge shop and plate shop. The machines are to be exported. Engine lathes, punches and shears, and steam hammers are included.

Otherwise, the machine-tool market has been exceedingly quiet during the past week. Machine-tool salesmen who have been visiting manufacturing plants report that users of tools are hesitating because of the uncertainty as to when the railroad congestion will be fully cleared up. In some lines of manufacture, output is checked, either because of shortage of raw materials or the uncertain outlook for business within the next few months.

Hardinge Bros., Chicago, have appointed the New York Machinery Sales Division of the Henry & Wright Mfg. Co., 136 Cedar Street, New York, their selling agents in the New York territory. The firm manufactures the Cataract precision bench lathes.

Crane sales continue small with the exception of hand power cranes for which there are a large number of inquiries from foreign markets. Manufacturers of electric hoists also report numerous inquiries and sales. According to crane manufacturers interested in freight handling at docks and terminals the present labor difficulties at New York, which have diverted much shipping to Philadelphia and other ports, has awakened a greater interest than ever before in material handling machinery for this port. Dwight P. Robinson, Inc., 61 Broadway, is in the market for four hand power cranes; the American Woolen Co., Boston, for a small hand power crane; Melchior, Armstrong & Dessau, Inc., 116 Broad Street, New York, for a small hand power crane; the Harris Mfg. Co., 1480 Broadway, New York, for a 15-ton overhead traveling crane; and the Amoskeag Mfg. Co., Manchester, N. H., for a 60-ton overhead traveling crane.

Recent sales include: The Cleveland Crane & Engineering Co., a 5-ton, 24-ft. span hand power crane to the McDougal Powder Co., New York; the Morgan Engineering Co., a 3-ton bucket crane, 1½-yd. capacity, to the Atlantic Refining Co., Philadelphia; the Milwaukee Electric Crane & Mfg. Co., a 25-ton, 55-ft. span overhead traveling crane, to Sotter Brothers, Pottstown, Pa.; the Shepard Electric Crane & Hoist Co., a 5-ton 43-ft. 6-in. span overhead traveling

crane to the Monroe Binder Board Co., Monroe, Mich., and five 5-ton, 60-ft. span overhead traveling cranes to Johnson & Thompson, Birmingham, Ala.

The Motco Furnace Co., New York, has been incorporated with a capital stock of \$100,000 by P. B. McCoy, J. E. Egan and E. E. Gilman, 149 Broadway, to manufacture furnaces and other iron and steel products.

The Highway Motor Truck Corporation, New York, has been incorporated with a capital stock of \$2,000,000 by J. L. Watson, E. S. Hawley and F. H. Butchorn, 764 St. John's Place, Brooklyn, to manufacture motor trucks.

Aeronautical Equipment, Inc., 33 West Forty-second Street, New York, manufacturer of airplane equipment, has increased its capital to \$250,000.

The Willoughby Co., Dwyer Avenue, Utica, N. Y., manufacturer of automobile bodies, will build a new one-story plant, 70 x 450 ft.

The A. Hawkes Electrical Specialties Co., New York, has been incorporated with a capital stock of \$25,000 by C. A. Frueauf, W. E. Young and A. Hawkes, 313 West Forty-fourth Street, to manufacture electrical products.

James W. Kent, 29 Gold Street, Brooklyn, has awarded contract to Rufus H. Brown, 350 Fulton Street, for a one-story machine shop, 47 x 100 ft., on Plymouth Street, near Bridge Street, to cost about \$15,000.

The G. Piel Co., 29 Thirteenth Street, Long Island City, manufacturer of machinery, parts, etc., has awarded all building and miscellaneous contracts, including heating, etc., for its new plant on the block bounded by Seventh and Eighth streets, Washington and Pierce avenues, to cost about \$475,000.

Macrae & Rose, 94 Seneca Street, West New Brighton, S. I., operating a block cutting plant, have filed plans for a two-story addition, 30 x 100 ft., to cost \$21,300, on Broadway, near Seneca Street.

The Pathe Freres Phonograph Co., 18 East Forty-second Street, New York, manufacturer of talking machines, parts, etc., with plant on Grand Avenue, Brooklyn, has increased its capital from \$4,000,000 to \$22,750,000. It is organized under Delaware laws.

The E. W. Bliss Co., Adams and Plymouth Streets, Brooklyn, manufacturer of presses, machinery, etc., has awarded contract to W. H. & F. W. Cane, Woolworth Building, New York, for a one-story building, 200 x 200 ft., at its ordnance works, Fifty-fourth Street and Second Avenue, to cost about \$200,000.

The Owen Magnetic Motor Car Corporation, 1767 Broadway, New York, has been incorporated in Delaware with a capital stock of \$2,500,000 by Raymond M. Owen, F. Y. Forbes and A. W. Evans.

The Wayne Power Co., Sodus, N. Y., has been granted permission to erect an electric power plant for service to Fremont, Howard and Hornellsville.

The New York Central Railroad Co., Grand Central Terminal, New York, has filed plans for a two-story serv-

ice building and automobile repair works at 109-113 West End Avenue, 100 x 100 ft., to cost about \$60,000.

The National Kalamein Co., Brooklyn, has been incorporated with a capital of \$25,000 by B. Billig, J. G. Apfel and G. B. Reimel, 1075 Bryant Avenue, to manufacture iron and steel products.

The Klein Iron Works, 65 Broadway, Long Island City, N. Y., has acquired about 10,000 sq. ft., on Vernon Avenue, for the erection of a new two-story plant.

James Gear, Inc., New York, has been incorporated with a capital stock of \$50,000 by I. E. Chandler, C. B. Glasser and James Gear, 155 East Thirty-fourth Street, to manufacture hardware products.

The Contra-Pole Electric Co., 1231 Prospect Place, Brooklyn, manufacturer of electrical specialties, has increased its capital from \$100,000 to \$155,000.

The Brooklyn Edison Co., 360 Pearl Street, Brooklyn, has filed plans for the erection of a one-story power plant, 40 x 100 ft., on Washington Avenue, near Flushing Avenue, to cost about \$40,000.

The Carvan Coach Works, New York, has been incorporated with a capital stock of \$50,000 by J. C. Hines, A. H. Seymour and F. L. Welliver, 43 Exchange Place, to manufacture automobile bodies.

Samuel Weisglass & Co., 13 Montauk Avenue, Brooklyn, manufacturers of brass and iron beds, have completed plans for a new plant at Milford Street and Atlantic Avenue.

The Rayburn Mercantile Corporation, New York, has been incorporated with a capital stock of \$175,000 by B. Butzel, L. F. Fink and M. J. Dublin, 451 West Forty-fourth Street, to manufacture machinery and parts.

The property of Beer Sondheimer & Co., Inc., 61 Broadway, New York, manufacturer of aluminum products, will be sold by Francis P. Garvan, Alien Property Custodian, on June 15.

Rapp & Ford, Inc., Brooklyn, has been incorporated with a capital stock of \$20,000 by W. F. Rapp, O. W. Adams and R. E. Ford, 35 Stephens Court, to manufacture machinery and parts.

The Scott Clock Corporation, Brooklyn, recently organized, has leased property at 226-32 Smith Street, extending to 243-55 Bush Street, for its plant. The structures will be remodeled to accommodate the new business.

The Charles Millar & Son Co., Utica, N. Y., manufacturer of lead pipe and other metal specialties, with branch plant at Binghamton, N. Y., has increased its capital stock from \$300,000 to \$1,000,000.

The McFarlane Automobile Co., New York, has been incorporated with a capital stock of \$73,000 by W. J. Fall-ton, M. Stires and W. C. Graham, 225 West Sixty-ninth Street, to manufacture automobiles and parts.

The Motor & Industrial Corporation, 25 Howe Avenue, Passaic, N. J., has been incorporated with a capital stock of \$50,000 by Gustave A. Fischesser, Walter Ratzer and John J. Roegner, to manufacture tools, machine parts, etc.

The Verona Machine & Tool Co., Verona, N. J., has filed notice of organization to manufacture machinery and tools, with plant at 1 Mountinside Avenue. Erich Lehmann heads the company.

The Wirebounds Corporation, 19 West Forty-fourth Street, New York, manufacturer of baling wire, etc., has arranged for the removal of its offices from New York to its new plant at Rockaway, N. J., where remodeling and alteration work is under way at the former plant of the Liberty Cycle Co., recently acquired. The company's main plant is at Chicago.

The Washington Metalcraft Corporation, 243 Washington Street, Jersey City, N. J., has been incorporated with a capital stock of \$100,000 by I. F. Goldenhorn and Farrell Meher, to manufacture metalware specialties.

The Union Iron Works, 125 Charlton Street, Newark, N. J., has filed notice of organization to manufacture iron and steel specialties. Lewis Sazer, 146 Somerset Street, heads the company.

The Victor Rite-Lite Co., 324 Bloomfield Avenue, Montclair, N. J., has been incorporated with a capital stock of \$125,000 by Hector S. Hill, East Orange; George W. J. Crabb, Newark; and John Edward Rennie, Bloomfield, to manufacture automobile chains and kindred specialties. It will take over the works and business of the Stanley Non-Skid Chain Co., Montclair.

The United Blue Print Machine Co., 125 Charlton Street, Newark, has filed notice of organization to manufacture special machinery, etc. Stewart T. Mead, 126 Stuyvesant Avenue, heads the company.

The National Ticket Punch Co., Newark, has been incorporated with a capital stock of \$25,000 by William Facewitz and Harry Siegal to manufacture punches and kindred specialties.

The George W. Goethals Co., 40 Wall Street, New York, has secured an interest in the Splittorf Electrical Co., 98 Warren Street, Newark, manufacturer of ignition equipment, etc., and in the future will be associated in the management of the plant and business. It is said that operations will be continued as heretofore, with present operating organization. R. W. Sutherland is general manager.

The Uzlay Mfg. Co., 10 Johnson Street, Newark, has filed notice of organization to manufacture surgical instruments. Stephen Uzlay, 475 Fifteenth Avenue, heads the company.

The Post Office Department, Washington, D. C., is arranging for the discontinuance of the Heller Field, Newark, as the eastern terminus of the Aerial Mail Service, with removal of such point to the Hazelhurst Field, Long Island. It is proposed to establish a maintenance, repair works, and general parts station at the present Heller Field.

The Bretscher Mfg. Corporation, Newark, has been incorporated with a capital stock of \$100,000 by Hans Bretscher and Rudolf Burkart, to manufacture mechanical and metal specialties.

The Beach Converter Corporation, Thomas Street, Orange, N. J., has been incorporated with a capital stock of \$150,000 by Ralph H. Beach, William B. Lord and William Hill, to manufacture hydro-carbon converters, carbureters, vaporizers, etc.

Catalogs Wanted

Dee Henderson & Co., exporters and importers, 15 Maiden Lane, New York, desire catalogs and prices on the following: Machinery for making wire nails, electrical supplies, textile machinery, oil and gas engines, acetylene and similar lighting plants, small electrical lighting plants, iron and steel wire drawing machinery, machinery and equipment for a large jewelry factory and scientific books. Mr. Henderson expresses a desire particularly to get the catalogs and prices first, and wishes quotations c.i.f. Calcutta, or on board steamer, Pacific port.

New England

Boston, May 31.

An analysis of the amount of business booked shows that May was a better month in the local machine-tool market than anticipated. One leading house reports sales in excess of those for April and other large companies booked sufficient orders the closing days to make a very creditable showing. Some large lists, notably the Amoskeag Mfg. Co. and the Saco-Lowell Shops, Boston, remain unfilled. Machine-tool dealers, however, report prospective business as noticeably lacking.

Most manufacturers, especially those in the Connecticut valley, have plenty of work on hand, but are having difficulty in securing labor and materials and consequently are not interested in machine tools at the moment. In and around Waterbury, Conn., a majority of plants are either closed or operating at minimum capacity because of labor troubles. Employees of the General Electric Co., Lynn, Mass., have voted on the question of striking but have not taken any definite action. The situation is uncertain, which may account for the decrease in the company's buying activity. Manufacturers of textile machinery are still busy, especially on export orders and are buying single tools now and then, but their attitude seems to be to await deliveries of machines on order before investing more money in equipment. The Stafford Co., Readville, Mass., weaving machinery, is installing two large Ingersoll millers and one of special design of another make, and has set up spindle drills and other new equipment.

More price advances have been made. One make of lathes has advanced 10 per cent, railroad shop equipment is 10 to 15 per cent higher and it is anticipated that some planers will be marked up at least 10 per cent in the near future. Collections are slowing up, undoubtedly as a result of tight money market conditions, but no uneasiness is felt on this score.

The United Shoe Machinery Co., Beverly, Mass., has been the most active buyer the past week and has closed on six 24-in. planers, 24 milling machines, drills and miscellaneous tools, purchases totaling upward of \$100,000. The Bethlehem Shipbuilding Corporation has bought for its Fore River plant, Quincy, Mass., two boring mills, in addition to lathes, drills, milling machines, grinders etc., for scout cruiser construction work. The Fore River plant recently delivered the last of 71 destroyers built under war contracts which amounted to more than \$100,000,000. Machine-tool equipment just purchased is intended for a new combination shop, 51 x

222 ft., work on which has started. The Newport Torpedo Station, Newport, R. I., has bought two 2-spindle and two 4-spindle drills, thread making tools and millers, but purchases by and for other New England Government plants have been nil.

The Boston Elevated Railway Co. has bought an additional lathe, and another New England street railroad company has closed on two carwheel lathes. Steam railroad purchases are few and far between. The New York, New Haven & Hartford Railroad is installing at its East Hartford, Conn., shop, a 40-in. lathe, 18-in. boring machine, 26-in. planer, 24-in. slotting machine and other equipment. The Boston & Maine has contracted for a small lathe, the Boston & Albany for a portable lathe, and the Central Vermont Railroad for a heat treating furnace. New England railroad equipment companies are not buying tools.

The Mead-Morrison Mfg. Co., South Boston, coal handling machinery, is in the market for miscellaneous equipment, including a belt-driven bench miller. The Eco Mfg. Co., South Boston, piston rings, is installing chucking grinders and contemplates purchases of additional equipment, but not in the immediate future. A large amount of equipment has been purchased for the Taft-Pierce Mfg. Co., Pawtucket, R. I., special machinery, the most recent purchase being lathes, and the list is almost completed. It will be used in the manufacture of automobile parts for interests formerly associated with the Ford company, who eventually will erect their own plant.

The Wickwire-Spencer Steel Corporation has bought a 10-ton used traveling crane for one of its Worcester plants. Stone & Webster, Boston, engineers, have purchased crane equipment for a Missouri lead property and are in the market for cranes for other projects. The Amoskeag Mfg. Co., Boston, has inquiries out on a small crane.

Cyrus Chamberlain, president Blakeslee Drop Forge Co., Southington, Conn., has bought the Masium Munitions Co., New Haven, Conn., drop forgings, employing about 100. The property is well equipped and in condition to start capacity production.

The Remington Arms Union Metallic Cartridge Co., Bridgeport, Conn., will be absorbed by the Remington Arms Co., which recently filed a Delaware charter with an authorized capital of \$110,000,000, consisting of \$100,000,000 common stock, no par value, and \$10,000,000 preferred, par \$100. It is also planned to take over cutlery manufacturing interests for the purpose of engaging in that industry. The Remington Arms Union Metallic Cartridge Co. was incorporated in January, 1916, with a capital stock of \$50,000,000 and took over the Remington Arms & Ammunition Co. One of its largest units was recently acquired by the General Electric Co.

The Jamcap Rim Tool Co., Boston, capitalized for \$250,000 and recently incorporated under Massachusetts laws, has leased a machine shop at 38 Charden Street where the manufacture of a tool for breaking or expanding split automobile rims has begun. Moses Caplan is president and James H. Caplan, treasurer. The company has under contemplation expansion plans, but details are not yet available.

Bids will soon be asked on a small addition to the plant of the Portsmouth Auto Body Co., Portsmouth, N. H. T. J. Moyan is manager.

The Hardware City Mfg. Co., New Britain, Conn., has acquired the plant and machinery of the Elm City Brass & Rivet Co., Plainville, Conn. The building has about 18,000 sq. ft. of floor space and additions at a future date are contemplated. Frank Garrigus, Bristol, Conn., will be superintendent of the Plainville plant.

Plans have been drawn for a manufacturing plant for the New England Machine & Electric Co., Pawtucket, R. I.

Plans are being drawn for a one-story addition to the power house of the Fitchburg Gas & Electric Co., Fitchburg, Mass.

Contract has been awarded for the construction of a two-story plant for the New England Tire & Rubber Co., Chicopee, Mass.

Work on the two-story manufacturing building contemplated by the William J. Murdock Electric Co., Chelsea, Mass., has been held up until fall.

A permit has been issued to the Buckley Foundry Co., Springfield, Mass., for a foundry on Roseland Street.

The United States Shipping Board has sold the Housatonic Shipyards, Stratford, Conn., to Albert T. Stuart, vice-president T. Stuart & Son Co., Newton, Mass., contractors.

Contract has been awarded by the Metropolitan Air Goods Co., Athol, Mass., for the erection of a two-story brick and concrete manufacturing building, 50 x 139 ft.

The Crocker-Burbank Association, Fitchburg, Mass., paper manufacturer, has let contracts for several additions to its plant, including an extension to the machine shop which, when completed, will be 48 x 319 ft.

The Middletown Firearms & Specialty Co., Middletown, Conn., repeating rifles, revolvers, etc., will occupy two additional floors at its present location on Warwick Street, which will enable it to more than double the output. Installation of machinery will begin in the near future. F. I. Dodge is general manager.

A Connecticut corporation is being formed for the manufacture of fabrics and contract has been awarded for the erection of a plant to cost approximately \$100,000 at Portland, Conn., including a machine shop. T. M. Russell, president Russell Mfg. Co., Middletown, Conn., is one of the prime movers in the enterprise.

The Yale & Towne Mfg. Co., Pacific Street, Stamford, Conn., has completed plans for two one-story additions, 27 x 93 ft. and 17 x 23 ft., to cost about \$15,000.

The Cutaway Harrow Co., Higganum, Conn., manufacturer of agricultural equipment, is planning for the erection of a brick and steel addition to cost about \$100,000, including equipment.

The Brite-Lite Lamp Mfg. Co., Providence, R. I., has been incorporated with a capital stock of \$50,000 by George Coby, 146 Smith Street; Ely Engatoff and John M. Otter, to manufacture electric lamps.

The Hartford Metal Treating Co., Hartford, Conn., has filed notice of dissolution.

The Seamless Rubber Co., New Haven, Conn., has disposed of its present plant to Adolph Perloth, comprising eight buildings, aggregating about 151,687 sq. ft. of space, with total site of 2½ acres. The property will be arranged to accommodate a number of manufacturers. The Seamless company is building a new plant with about double the amount of floor space, and expects to have the works ready for occupancy early in September.

The Page-Steele & Flagg Co., New Haven, Conn., has been incorporated with a capital of \$35,000 by F. H. Page, 467 Ellsworth Avenue; G. E. Steele and N. W. Flagg, to manufacture hardware products, etc.

Edward Miller & Co., Meriden, Conn., manufacturers of heaters, lamps, etc., have taken bids for a five-story brick addition.

The International Silver Co., Meriden, Conn., is having plans prepared for a one-story forge shop addition to its plant at Florence, Mass., 40 x 85 ft., to cost about \$25,000.

The Abbott Ball Co., Elmwood, Conn., has awarded a contract to the J. H. Grozier Co., Hartford, for the erection of a one-story addition, 50 x 75 ft.

The United Illuminating Co., 84 Temple Street, New Haven, Conn., is taking bids for the superstructure of its proposed new electric generating plant on the Pequonnock River, near Bridgeport, Conn., estimated to cost in excess of \$1,000,000, including equipment. Westcott & Mapes, 207 Orange Street, New Haven, are the architects and engineers.

The Union Mfg. Co., Hartford, Conn., has bought the Somerset Grove Foundry, Somerset, Mass., organized in 1854 for the manufacture of Glendale stoves. The manufacture of stoves will be continued and the foundry enlarged.

The Greenfield Tap & Die Corporation, Greenfield, Mass., has acquired the common stock of the Lincoln Twist Drill Co., Taunton, Mass. Through this acquisition the Greenfield company will have a complete line of taps, dies, reamers and twist drills. The Taunton plant will be enlarged if necessity requires.

Work on the new plant of Rauch & Lang, Inc., Willimansett, Mass., electric motor vehicles, will start in the near future. The site adjoins the new Stevens-Duryea Co. plant. The company was incorporated under Delaware laws to take over the Baker, Rauch & Lang Co., Cleveland.

Philadelphia

PHILADELPHIA, May 31.

The Leeds & Northrup Co., 4901 Stenton Avenue, Philadelphia, manufacturer of electric measuring instruments, has acquired three acres on Germantown Avenue, near Wayne Junction, for a consideration of about \$35,000. It is planned to use the site for the erection of new works.

E. E. Brown & Co., Inc., Philadelphia, operating a foundry at McKean and Meadow streets for the manufacture of sash weights, etc., has filed plans for a one-story addition.

The Diamond Garage Co., 2316 North Fifteenth Street, Philadelphia, is having plans prepared for a three-story service and repair building at Fifteenth and Dauphin streets, to cost about \$20,000.

The Keiserman Auto Top Co., 1408 Oxford Street, Philadelphia, manufacturer of automobile tops, has acquired a three-story building at 642-44 North Sixteenth Street, for the establishment of a plant.

The Electric Storage Battery Co., Nineteenth Street and Allegheny Avenue, Philadelphia, has filed plans for a two-story brick shop addition, 82 x 160 ft., to cost about \$125,000, including equipment.

The Richard De Cou Co., Twelfth and Noble streets, Philadelphia, manufacturer of structural iron and steel, etc., has acquired property at Eastwick Avenue and Sixty-third street, totaling 900 x 1020 ft., for a consideration said to be \$85,000. It will be used in connection with its plant.

The City Council, Camden, N. J., has authorized the Harbor Committee to erect a new marine terminal and warehouse at the foot of Spruce Street. Contracts will be awarded at an early date. The mechanical installation will include conveying machinery, loading and unloading machinery, etc.

A three-story power plant, 40 x 60 ft., to cost about \$150,000 with equipment, will be erected by the Susquehanna Silk Mills, Jersey Shore, Pa. Headquarters of the company are at 149 Madison Avenue, New York.

The Weatherly Steel Co., Wilkes-Barre, Pa., a Delaware corporation, has increased its capital stock to \$150,000.

The Gobfrete Pipe & Construction Co., Harrisburg, Pa., has been incorporated with a capital stock of \$50,000 by W. L. Martin and James R. Appleby, Harrisburg, and Alfred L. Anderson, Altoona, Pa., to manufacture pipe and similar products.

The Lebanon Steel Foundry Co., Lebanon, Pa., has had plans prepared for a three-story brick and concrete addition, 55 x 110 ft., to cost about \$30,000.

The Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., has increased its capital stock from \$1,150,000 to \$8,000,000.

The Summerill Tubing Co., Bridgeport, Pa., manufacturer of metallic tubing, etc., has rejected bids for the erection of its new two-story plant, 60 x 120 ft., and new bids will be asked at an early date. Harry G. McMurtrie, 1012 Walnut Street, Philadelphia, is the architect.

The Chambersburg Foundry Co., Chambersburg, Pa., has closed down its plant, effective May 22, for an indefinite period. Continuance of labor troubles is said to be responsible for the action, and it is likely that the company will close the business. Robert Snyder is treasurer.

The Enduro Porcelain Enameling Co., Middletown, Pa., recently organized, has been incorporated with a capital stock of \$60,000. A building has been secured for the establishment of a plant. Officials of the Wincroft Stove Works, Middletown, are interested in the company.

A new steel conveyor runway system to cost about \$15,000 will be installed by John T. Lewis Brothers & Co., Lafayette Building, at their works, 2530 East Huntingdon Street.

The McFarland Foundry & Machine Co., Trenton, N. J., has filed plans for two buildings on Willow Street, to form the first units of a new plant, to cost about \$30,000. The main structure will be brick and steel, one-story, 50 x 120 ft., equipped as a foundry.

The Trenton Steel & Wire Co., Ingham Avenue, Trenton, N. J., has construction under way on a one-story plant, 60 x 200 ft., to cost about \$22,000. It is expected to install equipment and inaugurate operations at an early date.

The Ajax Rubber Co., Breunig Avenue, Trenton, N. J., manufacturer of automobile tires, has awarded contract to the N. A. K. Bugbee Co., 206 East Hanover Street, for a four-story brick and steel building, 60 x 100 ft., to cost about \$60,000.

The John Wood Mfg. Co., Conshohocken, Pa., manufacturer of boilers, tanks, etc., has acquired the sheet iron rolling mill at Fayette and Canal streets, operated by water power and constructed in 1832. It will be remodeled and improved by the new owner and used in connection with the works.

Buffalo

BUFFALO, May 31.

The Standard Oil Co., 1103 Elk Street, Buffalo, has awarded a contract to the J. W. Cowper Co., Fidelity Building, for a one-story addition at its plant, 100x260 ft., to cost about \$30,000. It will be used for mechanical service, with installation to include pressing equipment, chilling apparatus, etc.

The Beaver Board Companies, Beaver Road, Buffalo, manufacturer of wall board, roofing, etc., has arranged for a stock issue of \$1,000,000. The company operates seven plants in different parts of the country.

The Cyclemotor Corporation, 149 Cady Street, Rochester, N. Y., manufacturer of motors for motorcycles, etc., is having plans prepared for a two-story addition, 80x100 ft., to cost about \$50,000.

The Syracuse Gear Co., Syracuse, N. Y., has been incorporated with a capital stock of \$50,000 by E. A. Brennan, J. C. Roth and E. R. Deming, to manufacture gears and kindred equipment.

The M. L. Oberdorfer Brass Co., 804 East Water Street, Syracuse, has increased its capital stock from \$500,000 to \$1,400,000 and has arranged for the erection of a foundry addition.

The Syracuse Aero Corporation, Syracuse, has been incorporated with a capital stock of \$20,000 by C. G. Hanna, D. M. Dey and T. A. Young, to manufacture airplanes, parts, etc.

The H. H. Franklin Mfg. Co., Syracuse, manufacturer of automobiles, has increased its capital stock from \$7,000,000 to \$23,000,000.

The Panel Co., Jamestown, N. Y., is planning to rebuild its engine plant, recently damaged by fire with loss estimated at \$50,000.

Considerable mechanical and electrical equipment will be installed in the two additions to be erected at Niagara Falls, N. Y., by the Kimberly & Clark Paper Co., Pine Street, and the Paper Convertible Co. The first structure will be two-stories, 145x460 ft., concrete and steel, to cost about \$700,000, with equipment. The other will be two stories, 105x375 ft., concrete and steel, and will cost \$300,000. Both contracts have been let to the Lackawanna Bridge Co., Buffalo.

The Electric Smelting & Aluminum Co., Niagara Falls, N. Y., is planning for a one-story addition on West Jackson Street, to cost about \$10,000.

The Gray Machine Tool Co., Inc., Buffalo and Toronto, has increased its capitalization to \$300,000 and is preparing to establish a plant in Batavia, N. Y., for the manufacture of Gray thread millers, Gray piston blasting machinery and other machinery. It has acquired the unoccupied factory of the Batavia Steel Products Co. with floor space of 500,000 sq. ft., and on June 15 will begin the installation of machinery. The Gray Ball Bearing Co., Ltd., Toronto, Ont., a subsidiary company, manufactures ball bearings. Alexander Gray is president. The general manager of the Batavia plant will be A. M. D. Martin, now secretary.

Baltimore

BALTIMORE, May 31.

Plans for the construction of an addition, 50 x 210 ft., are being made by the Chesapeake Iron Works, Westport, Baltimore. Frank S. Chavannes is president.

A one-story machine shop, 34 x 50 ft., will be built by M. Martin, Belle and Hamilton avenues, Baltimore.

The S. O. S. Welding Corporation, Lexington Building, Baltimore, has been incorporated with \$300,000 capital. The incorporators are Samuel K. Dennis, Paul M. Higinbotham and Gerald W. Hill.

Quotations on angles and channels are desired by C. H. Turner, Statesville, N. C.

The Blackburn Mill Mfg. Co., West Jefferson, N. C., recently incorporated with \$100,000 capital stock to manufacture mill machinery, is arranging for the establishing of a plant and prices are wanted on boring mills, compressors, etc. E. L. Robbins is secretary and treasurer.

Prices on screw cutting engine lathes are being sought by the Southern Implement Mfg. Co., Columbus, Ga.

Charles L. Stockhausen, Gay and Water streets, Baltimore, has purchased the plant of the General Shipping Co., Inc., Alexandria, Va., at a price said to be \$50,000. It was originally established for the construction of submarine chasers. Mr. Stockhausen is said to have made the purchase for investment purposes.

Quotations on cupolas, motors and blowers are wanted by the Etowah Foundry & Machine Co., Gadsden, Ala. C. P. Butcher is manager.

The Ordnance Department, Washington, D. C., is arranging for the sale of the Government boiler plant at South Richmond, Va., erected during the war and representing an investment of about \$2,000,000. The works will be dismantled and the material salvaged.

The Wizard Check Indorser & Printing Machine Co., Calvert Building, Baltimore, recently incorporated with a capital stock of \$500,000, is negotiating for the purchase of about three acres in the vicinity of the Key Highway and Fort Avenue, as a site for its proposed works. The plant will consist of a number of buildings and with machinery is estimated to cost about \$300,000. The company is said to have orders for machines to insure capacity operation for several months. F. S. Weise is president.

The Niagara Oil Burner Co., 909 H Street, N. W., Washington, D. C., manufacturer of oil burners, has changed its name to the Air-Oil Burner Co.

The Maryland Pressed Steel Co., Hagerstown, Md., has suspended operations temporarily at its airplane construction department. The shut down is said to be due to difficulty in securing motors, as well as present uncertainties.

The C. E. Hosbach Co., 10 North High Street, Baltimore, manufacturer of automobile bodies, parts, etc., has filed plans for a one-story brick machine shop, 40 x 82 ft., on North High Street.

The Bartlett-Hayward Co., Scott and McHenry streets, Baltimore, has acquired an entire block at Wicomico and Clare streets, and is said to be planning to erect a new building.

The Mayhew Steel Products Co., Inc., 291 Broadway, New York, has awarded contract to the Harrison Construction Co., Petersburg, Va., for three one-story buildings at Hopewell, Va., 90 x 200 ft., each, to form its proposed new plant.

The Virginia-Carolina Rubber Co., 600 Broad Street, Richmond, Va., recently incorporated with a capital stock of \$200,000, has acquired a site, aggregating about 10 acres, for the erection of a plant for the manufacture of automobile tires. Charles L. Shackelford is secretary.

Property of the Dare Lumber Co., Buffalo City, N. C., will be sold at public sale on June 19, to satisfy a claim of the Metropolitan Trust Co., New York, including machine shops, forge shops, boiler plant, electric light and power plants, logging roads, locomotives and cars, mills and machinery, barking drums, transfer machines, tools, etc.

The Academy Shop Mfg. Co., Troutman, N. C., has been incorporated with capital stock of \$125,000 by M. E. and J. O. Johnson, and T. H. Platt, to manufacture canning machinery.

The Glass & Arthur Iron & Brass Foundry Co., Gastonia, N. C., has completed plans for a one-story foundry, 50 x 70 ft.

Cleveland

CLEVELAND, May 31.

The machine tool market shows little change compared with a week ago. Sales are light and are confined almost entirely to single machines for immediate delivery. Outside buyers want to be assured before placing orders that transportation facilities will permit shipments without delay. Several inquiries have been held up because of general conditions, but in some cases manufacturers are going ahead and placing orders to carry out plans decided upon some time ago. Cleveland machinery houses report a good demand from Detroit for repair parts, where manufacturers are taking advantage of the slowing up in production to repair their machinery. However, practically no orders for machinery are coming from the Detroit district. The American Steel & Wire Co. is placing orders for several machines for one of its Cleveland plants and the Upson Nut Co. has placed orders for a number of castellating machines. The Automobile School Products Co., Cleveland, purchased a few machines the past week.

The railroad situation with respect to deliveries of machinery shows little change. Dealers are getting consolidated carload shipments fairly well but a great deal of single tool shipments have been held up in transit for several weeks.

The slowing up of the automotive industry has resulted in some cancellation of orders for castings and gray iron foundries are not so crowded with work, although they still have all they can do and report that the supply of molders is very scarce.

The Superior Screw & Bolt Mfg. Co., Cleveland, has been organized with a capital stock of \$500,000 and will shortly begin the erection of a plant for the manufacture of cap screws and bolts. The building will be of brick and steel, one and two stories, providing 50,000 sq. ft. of floor space. Following completion of the Cleveland plant the company plans to build four other manufacturing units in other cities. N. T. Jones is president; N. J. Riley, vice president, and Warwick J. Hayes, secretary and treasurer. Mr. Jones and Mr. Riley recently severed their official connection with the Foster Bolt & Nut Mfg. Co., Cleveland, with which they had been associated since the formation of that company, the former as secretary and sales manager and the latter, director and superintendent.

The Tool & Auto Products Co., Cleveland, has acquired a site and building at East Forty-ninth Street and St. Clair Avenue and will erect an extension and move from its present quarters at East Seventy-third Street and St. Clair Avenue. The company manufactures special production tools and fixtures.

The Baines Engineering Co., in which several Cleveland men are interested, has been organized and has acquired the plant of the Hinkle Mfg. Co., Dover, Ohio, for the manu-

facture of power cultivators. Later a tractor will be manufactured. G. P. Koelliker, secretary Citizens Savings & Trust Co., is president; Henry C. Baines, vice-president, and Lee Miller, secretary and treasurer.

The Phoenix Tube Co., Warren, Ohio, has placed its new plant in operation and will manufacture tubing.

The American Clay Machinery Co., Bucyrus, Ohio, has changed its name to Hadfield-Penfield Steel Co., following an alliance made some time ago with the Hadfield interests in England. The company's Mansfield and Willoughby, Ohio, plants will also be operated under the same name.

The Bucyrus Machine & Tool Co., Bucyrus, Ohio, has been placed in the hands of C. F. Michael and others as receivers. It is said that the receivership resulted from the congested situation and the company's inability to complete contracts under these conditions.

The L-M Axle Co., Cleveland, has been reorganized and has elected W. H. Cowdrey, chairman of the board; G. B. Burrell, president and treasurer; R. L. Queisser, vice-president, and J. L. Vaughan, secretary.

The Ohio Brass Mfg. Co., Mansfield, Ohio, is in the market for a 14-in. x 6-ft. and a 16-in. x 6-ft. lathe.

The Colonial Iron Works Co., Cleveland, has an inquiry out for a heavy duty 22-in. x 8-ft. engine lathe, bulldozer, forming press and a bending brake.

Milwaukee

MILWAUKEE, May 31.

The machine-tool trade is gradually slowing down from the peak reached in the early part of April, due to general conditions. Business in the month of May aggregated less than that in April, although the last half of the month produced a relatively good volume. Manufacturers, however, have enough orders to keep their plants busy for three to five months at capacity, limited only by their ability to man the works. The traffic situation continues to show improvement and deliveries are being made more promptly.

The Maynard Electric Steel Casting Co., Milwaukee, has increased its capital stock from \$125,000 to \$250,000 to finance increased production and additions to the works, on Kilbourn Road, near Oklahoma Avenue. The present plant was erected 18 months ago and is 150 x 240 ft. A one-story addition, 30 x 200 ft., is now being made to the molding floor, and the cleaning and shipping room will be enlarged 50 x 75 ft. The company specializes in general machinery castings and manufactures electric steel exclusively. The officers are: President and treasurer, Sylvester J. Wabiszewski; vice-president, Liebrecht Bergner; secretary, Julius K. Fons; general manager, Frank J. Wabiszewski.

The Continental Axle Co., Edgerton, Wis., which took occupancy of its new plant about five months ago, has let contracts for an additional machine shop unit, 68 x 150 ft. Orders are being placed for a small list of new tools, fixtures and other equipment. The improvement will cost about \$50,000. James W. Menhall is general manager.

The Joseph Obenberger & Sons Co., 125 Barclay Street, Milwaukee, manufacturer of light drop forgings, has increased its capital stock from \$15,000 to \$25,000 to increase its output.

The Ajax Auto Lock Co., of West Bend, Wis., has filed articles of incorporation with a capital stock of \$50,000 to manufacture patented locking devices for motor vehicles. A shop is being equipped. R. C. Labisky, L. Kuehlthau and F. W. Bucklin are promoting the enterprise.

The George P. Dravo Co., 1195 Thirtieth Street, Milwaukee, manufacturer of super-heaters, has broken ground for a one-story brick and concrete factory and shop addition, 60 x 100 ft., to cost about \$30,000 with equipment. George P. Dravo is president and manager.

The Milwaukee Auto Engine & Supply Co., 837 Twenty-ninth Street, Milwaukee, has increased its capital stock from \$100,000 to \$200,000. It is now occupying its new plant on Thirtieth Street, near North Avenue, 100 x 150 ft., with space for a second unit of equal size to be erected later. The shop on Twenty-ninth Street, with 11,000 sq. ft., will be kept in operation until that time. The company manufactures automotive accessories, specializing in a stamped steel timing device designed for Ford cars and Fordson tractors. It also makes bumpers and safety guards for passenger and commercial cars. B. D. Zimmermann is president and general manager.

The M. & R. Mfg. Co., of Milwaukee, has been organized with a capital stock of \$25,000 to manufacture machinery operated by electricity. The incorporators are Benjamin J. Morgan, Harriet E. Rundle and Edwin K. Rundle, 3524 Highland Boulevard.

The Village Board, of Oakfield, Wis., is taking bids until

June 7 for furnishing a centrifugal pump and 5-hp. 220-volt motor as additional equipment for the city waterworks. H. W. Warner is village clerk.

The Prudential Tire & Rubber Co., Erie, Pa., a Delaware corporation with a capitalization of \$4,000,000 of preferred and 60,000 shares of non-par value common stock, has filed articles in Wisconsin and has taken over the plant and equipment of the Boone Tire & Rubber Co., Chippewa Falls, Wis. George N. Graham is general manager.

The Ripon Handle & Specialty Co., Ripon, Wis., has been incorporated with a capital stock of \$20,000 to manufacture wire and wood package and luggage carriers, handles and advertising novelties. The incorporators are E. J. Burnside, L. E. Pynch and Fred J. Babcock.

The Lavine Gear Co., 60-80 Keefe Avenue, Milwaukee, is purchasing additional equipment for a one-story machine shop addition 150 ft. sq., which will involve an investment of \$100,000 in building and machinery. It manufactures steering gears and other parts for the automotive industries. Herman A. Uihlein is president.

The Longdin-Brugger Co., Fond du Lac, Wis., manufacturer of closed bodies for open passenger automobiles has increased its capital stock from \$120,000 to \$240,000. It moved into its new factory May 25. The new issue will be used to finance the new plant, equipment and raw materials. Current orders amount to \$500,000.

The Master Seeder Co., Milwaukee, has been incorporated with a capital stock of \$50,000 to manufacture agricultural implements and tools. The incorporators are Elroy A. Sievers, Herman A. Zimmermann and Victor H. Glanz, attorney, 1504 First Wisconsin National Bank Building, Milwaukee.

The Badger Refrigerator Specialty Co., Milwaukee, has been organized to manufacture refrigerating machinery, devices and accessories and has been incorporated with a capital stock of \$25,000. Otto L. Gray, Charles Schweinle and Edwin J. Augustin are the incorporators.

William Brueske, Madison, Wis., has let contract for a one-story machine and repair shop, 60 x 70 ft., to cost about \$18,000.

Pittsburgh

PITTSBURGH, May 31.

The Pittsburgh Screw & Bolt Co., Pittsburgh, will erect a one-story plant on Preble Avenue, Northside, to cost about \$30,000.

The Pittsburgh Gage & Supply Co., Thirtieth Street and Liberty Avenue, Pittsburgh, manufacturer of electrically operated washing machines, has broken ground for a one-story building, 64 x 105 ft., at 3026 Liberty Avenue, to cost about \$50,000.

The Grimes Motor Co., Carnegie, Pa., has been incorporated in Delaware with a capital stock of \$200,000 by W. F. Grimes, Carnegie; J. H. Grimes and P. P. Schneider, Crafton, to manufacture automobiles and parts.

The Pittsburgh Forge & Iron Co., Pittsburgh, is planning for the installation of new machinery to replace present equipment, and is considering the installation of a pulverized fuel plant. It recently increased its capital stock from \$205,000 to \$300,000.

The Union Coal & Coke Co., Johnstown, Pa., affiliated with the Cambria Steel Co., will build a new steel tippie at its Shidler shaft, Marianna mines.

The Paragon Motor Car Co., Connellsville, Pa., has completed plans and is taking bids for its new plant, comprising a one and two-story building, 400 x 540 ft. and 60 x 400 ft., respectively, estimated to cost close to \$1,000,000, including machinery. J. F. Kartz is president. T. F. Hockenthal, 494 Century Building, Cleveland, is the engineer.

The Wyatt-Bingamon Coal Co., Shinnston, W. Va., is planning for the construction of a new tippie at its properties, with capacity of about 1000 tons. It is also contemplating the installation of electrically operated haulage locomotives, mining machinery, etc.

The American Car & Foundry Co., 165 Broadway, New York, is planning for extensions and improvements at its works at Huntington, W. Va. It is said that in the next 24 months a total of \$500,000 will be expended in this work.

The Tranter Mfg. Co., 105-7 Water Street, Pittsburgh, operating a machine works, has installed a grinding department, primarily for automobile cylinder work, crankshaft machinery and other equipment. Later the company proposes to secure larger quarters, the present location now being utilized to capacity.

The Hite Machine Co., Huntington, W. Va., has been incorporated with a capital stock of \$50,000 by Harry P. Hite,

John Garvin and Joseph A. Sowell, to manufacture machinery and tools.

The Gordon Flying Co., Parkersburg, W. Va., recently incorporated, is arranging for the establishment of an aeroplane plant and assembling works in the vicinity of Bellaire, Ohio. A portion of the Belmont Casket Works has been secured, which will be equipped for assembling and repair operations. The company has taken a lease on about 5 acres at Shadyside and a portion of the tract will be used for hangars, station equipment, etc. Robert Gordon heads the company.

The Norfolk-Angle Colliery Co., Maybury, W. Va., is planning to rebuild its tippie and coal washing plant, recently destroyed by fire with loss estimated at \$200,000.

The Kentucky & West Virginia Power Co., Logan, W. Va., has completed plans for an addition to its electric power plant, to cost about \$500,000, including equipment.

The Freedom Oil Co., Freedom, Pa., has arranged an appropriation of \$75,000 for rebuilding its oil works in the vicinity of Wheeling, recently destroyed by fire with loss in excess of \$50,000. E. N. Craig is assistant to the president.

Detroit

DETROIT, May 31.

Uncertainty owing to transportation conditions and the financial situation continues to affect the machine tool trade. In spite of the dullness and the poor prospects for deliveries, however, few cancellations, if any, are recorded, most buyers being exceedingly anxious to obtain deliveries on material already ordered.

The first steps have been taken for occupancy by the Cadillac Motor Car Co. of the new factory on Clark and Scotten avenues, Detroit. Completion of the engineering offices and quarters for the experimental and research laboratories has made it possible to move these departments to the new plant, and other departments will be moved as fast as the new buildings are ready. The assembling building, with floor space of 620,000 sq. ft., is completed and equipment is being installed. The parts building is progressing rapidly, and the loading docks, which will have a capacity of 50 freight cars, will be completed in a few weeks. The power plant is complete and most of the machinery has been installed. When completed, the factory will contain more than 2,000,000 ft. of floor space.

While transportation conditions have hampered work on the new units being built for the General Motors Truck Co., Pontiac, Mich., work is again progressing. The main building, with 140,000 sq. ft. of floor space, is to serve as a machine shop. Several smaller buildings are also under way and will be needed to meet the 1921 schedule of 21,000 trucks.

Representatives of the Bacon Mfg. Co., Pontiac, Mich., have been looking over the ground at Romeo, Mich., with a view toward removal to the latter town. The Bacon concern makes hand and power seed cultivators.

Plans are being made for a new municipal power and lighting plant at St. Johns, Mich., to cost from \$240,000 to \$280,000.

The Central Construction Co., of Wooster, Ohio, has purchased a site and will build a plant at Flint, Mich. The company manufactures structural steel and has plants at Wooster and Elmira, N. Y.

The Congress Tool & Die Co., 7 East Fort Street, Detroit, plans the erection of a machine shop, one story, 55x116 ft., to cost \$20,000.

The Marshall Furnace Co., Marshall, Mich., is planning the erection of another addition for use as a foundry and pattern shop. It will also buy additional machine shop and cleaning room equipment. Machinery has been purchased for the foundry addition recently completed.

The Liberty Foundry Co., Detroit, is building a new foundry on Davison Avenue on the Detroit Terminal Railroad. The present plant is located at 1831 Center Line Avenue. The company has recently increased its capitalization from \$25,000 to \$100,000.

The Fletcher Machine Co., 547 McDougall Street, Detroit, is having plans drawn for a new one-story machine shop, 30x96 ft., to cost \$10,000.

The A. J. Detlaiff Co., 121-29 Lafayette Avenue, Detroit, plans to increase three-fold the capacity of its brass and aluminum foundries. The company manufactures automobile parts, gray and malleable castings and operates a machine and pattern shop.

The General Machine & Tool Co., Jackson, Mich., is preparing to erect a plant unit of one story, 90x140 ft., to cost about \$50,000.

The Lapeer Tractor-Truck Co., Lapeer, Mich., which has

given up the tractor business to devote all its facilities to the manufacture of trailers, has changed its name to the Lapeer Trailer Corporation. The capitalization has been increased from \$100,000 to \$300,000.

The Monarch Drop Forge Co., of Detroit, has been incorporated, with a capitalization of \$20,000.

The Central Screw Co., Jackson, Mich., will soon start the erection of a one-story addition 60x69 ft. The estimated cost is \$25,000.

The Jefferson Forge Products Co., Detroit, is planning for the erection of an addition, one story, 40x120 ft.

Indianapolis

INDIANAPOLIS, May 31.

The Westinghouse Lamp Co., New York, has bought 15 acres at East St. Clair and East Michigan streets, Indianapolis, on which it will establish a plant for the manufacture of incandescent lamps, to be a duplicate of the one at Trenton, N. J. About 700 will be employed and the daily production will be 50,000 to 70,000 lamps. The building will be four stories, concrete and steel daylight construction.

Work on a new factory for the Edison Lamp Co., at Fort Wayne, Ind., will begin next week. It will cost \$500,000.

The Rockwood Mfg. Co., Indianapolis, maker of pulleys, friction transmission and machinery, will build a foundry addition at 1801-2002 English Avenue, one-story, 141 x 202 ft.

The Cannelton Sanitary Plumbing, Cannelton, Ind., has been organized to manufacture plumbing material. A. J. Jackson and E. Fisher are at the head.

The Backstay Machine & Leather Co., Union City, Ind., has increased its capital stock from \$360,000 to \$600,000.

The Reiss Tool & Mfg. Co., Indianapolis, has been incorporated with \$15,000 capital stock to manufacture tools and dies. The directors are Frank Reiss, Henry P. Ross and Carl Dutton.

The Zenite Metal Co., Indianapolis, metal stampings, has increased its capital stock from \$5,000 to \$1,000,000.

Cincinnati

CINCINNATI, May 31.

The machine tool market is quiet compared with the first quarter of the year, partly due to general conditions throughout the country, the credit situation and transportation facilities. Delayed deliveries are also responsible to some extent for the relative quietness. Manufacturers in many cases are catching up on orders, while others, short-handed on account of the machinists' strike, are further behind. A very encouraging feature, however, is that no cancellations are being received, indicating that all tools ordered are actually needed. No local action has been taken on the lists issued by the various railroads, but purchases are expected momentarily. The Southern Railway is reported as having prepared a large list which will be issued shortly. No large inquiry is before the trade other than that previously reported, orders received being for one and two machines. Car building companies are said to be making up lists of requirements against the time when railroads place orders for equipment. Frog and switch companies are also reported to be probable customers, as inquiries are coming from various railroads as to their ability to handle orders promptly.

The Cincinnati Frog & Switch Co., Oakley, is erecting an extension. It recently purchased some new equipment, including plate shears and a planing machine, and the addition is to house the new machinery. The company will increase its common stock from \$100,000 to \$200,000 at a meeting to be held early in June.

The Cincinnati Tool Co. is erecting an extension to its plant in Norwood, Cincinnati. Its capital stock has recently been increased from \$20,000 to \$100,000.

The H. B. Ash Templet & Machine Co., Norwood, Cincinnati, has been incorporated with a capitalization of \$10,000. It will engage in the manufacture of special machinery, in addition to its present line. H. B. Ash is president.

The Ross Engineering Co., Dayton, Ohio, has been incorporated with a capitalization of \$10,000 by T. E. and T. H. Ross and will engage in production engineering. Offices have been opened in the Reibold Building.

The Ohio Tractor Co., recently incorporated at Columbus with a capitalization of \$500,000, will take over the plant of the Columbus Tractor Co., if the stockholders of the latter company approve the plans. Fred A. Miller is president of the new company.

The Eureka Tool & Die Co., Dayton, has purchased part

of the assets of the Dairy Engineering Co. It is understood that the lease of the property is included in the transaction.

The Springfield Aluminum Plate & Castings Co., with a capitalization of \$25,000, has been incorporated by I. H. Hook, H. H. Simondinger, W. J. Jordan, W. Ream, and E. H. Schuer all of Springfield, Ohio. It is proposed to operate a foundry for the production of small brass and aluminum castings.

The Dayton Body & Cabinet Co., recently incorporated with a capitalization of \$50,000, has taken over the Colonial distillery buildings at Trebeins, near Xenia, Ohio, and alterations are completed will install equipment for the manufacture of commercial automobile bodies. C. C. Breech is president.

Chicago

CHICAGO, June 1.

The Chicago, Burlington & Quincy has closed for \$150,000 worth of machine tools and is expected to expend \$50,000 or more, additional, before it completes its purchases. The following list, including standard machines and miscellaneous equipment, has been issued by the Chicago, Milwaukee & St. Paul:

- One 2½-in. x 26-in. motor-driven turntable lathe.
- One 2½-in. bolt cutter.
- One back-gear motor-driven 24-in. upright drill press.
- One 60-in. motor-driven radial drilling machine.
- One 48-in. throat double punch and shear.
- One link grinding machine with 2-hp. motor.
- One 42-in. standard vertical boring and turning mill.
- One No. 2 inside journal-turning attachment.
- One 600-ton 96-in. locomotive wheel press.
- One 1500-lb. single frame steam hammer.
- One pneumatic flue welding machine with capacity for 2-in. up to and including 6-in. flues.
- One flue welding furnace for welding flues up to and including 6-in.

One locomotive hoist consisting of six jacks each of 50 tons capacity, fitted with 50-hp. 220-volt direct current motor.

A large list recently issued by the Minnesota Steel Co. has been reduced to five large machines. The Rock Island is expected to take action on its inquiries this week or next. With these exceptions current orders and inquiries are principally for one or two machines. While business is by no means up to the level of the first quarter, dealers generally report having closed a fair month, probably 50 to 60 per cent of the totals for February and March. During the last half of May an improvement was noted; in the case of one dealer the first two weeks of the month averaged only 40 per cent of a similar period early in the year, whereas the last two weeks mounted to 80 per cent.

While cancellations have not reached such proportions as to cause alarm, they are more numerous than a week ago. Some sellers complain that the automotive plants have not only ceased buying but are holding up delivery on old orders.

Transportation has improved but is still decidedly unsatisfactory. Shipments out of stock are moving more freely, but deliveries from manufacturers are still generally poor, the principal exceptions being those from plants west of this city. The handling of machines to and from dealers' floors may be interfered with as a result of demands by the machinery handlers' union for 92½¢ an hr. and an 8-hr. day.

The Western Screw Mfg. Co., 5716 Armitage Avenue, Chicago, has purchased a one-story manufacturing building, 100x100 ft., at 4413-23 West Kinzie Street.

The Edward Katzinger Co., manufacturer of bakers' and confectioners' machinery, 120 North Peoria Street, Chicago, is receiving bids through A. S. Alschuler, 28 East Jackson Boulevard, on a seven-story factory at Washington Boulevard and Sangamon Street, to cost \$200,000.

The Elgin National Watch Co., Elgin, Ill., has received bids and will soon award contracts on a group of four and six-story laboratory and factory buildings to cost \$1,000,000.

The Chicago Blow Pipe Co., 216 North Sacramento Boulevard, Chicago, is receiving bids through Z. Erol Smith, 305 East Fifty-fifth Street, on a one-story machine shop, 75x75 ft., 220 Clarkson Court, to cost \$25,000.

The O. K. Giant Battery Co., 515 Broadway, Gary, Ind., is receiving bids through Z. Erol Smith, 305 East Fifty-fifth Street, Chicago, on an 11-unit plant to cost \$660,000.

The American Car & Foundry Co. has let a contract for a one and two-story addition, 25x116 ft., to its tin shop at 2417 South Paulina Street, Chicago, to cost \$22,000.

The Designers Instrument Co., 3323 North Ashland Avenue, Chicago, is receiving bids on a three-story addition, 40x60 ft., to cost \$30,000.

Thomas Dube, 1244 East Fifty-ninth Street, Chicago, is

asking for bids on a one-story boiler works, 79x125 ft., to cost \$15,000.

The Barco Mfg. Co., railroad supplies, 212 West Illinois Street, Chicago, has let contract for a one-story plant, 131x151 ft., at 1801-15 Winnemac Avenue, to cost \$75,000.

The American Manicopy Typewriter Co., Hammond, Ind., has purchased 10 acres near the works of the Standard Steel Car Co. and will build a plant for the manufacture of manicopy machines. Frank H. Repetto is president; Joseph McCabe, treasurer, and William Schiephan, secretary.

The Overland Crane Co. has bought four acres including former buildings of the G. H. Hammond Packing Co., Hammond, Ind., which it will remodel for the manufacture of locomotive cranes. P. J. McCain is president.

The Armstrong Machine Tool Co., 1001-3 South Adams Street, Peoria, Ill., has been incorporated with \$400,000 capital stock.

The Victor Foundry Co., Peoria, Ill., has increased its capital stock from \$50,000 to \$100,000.

The Thayer Plano Action Co., Rockford, Ill., will build a two-story machine shop to cost \$15,000.

Fire recently destroyed the building occupied by the Chamberlain Machine Works and the G. E. Metcalf foundry, Waterloo, Iowa. The loss is estimated at \$150,000, of which \$100,000 represented machinery and equipment. Plans are being prepared for replacing the structure.

The Western Iron & Foundry Co., Wichita, Kan., is constructing a one-story machine shop, 60x127 ft., to cost \$15,000. About \$18,000 worth of Government machinery has been purchased.

The Illinois Tool Works, 154 East Erie Street, Chicago, has leased a six-story building at the northwest corner of Erie and St. Claire streets, 109 x 144 ft., which it will utilize for general sales room, offices, and manufacturing plant.

The Western Foundry Co., 3634 South Kedzie Avenue, Chicago, has purchased a 3-acre tract at the corner of Wentworth Avenue and Sixteenth Street. The property is improved with several one-story brick structures.

The Magnetic Motors Corporation, 2521 Calumet Avenue, Chicago, manufacturer of automobile motors, is arranging a new one-story plant at Cottage Grove Avenue and Thirty-fourth Place, to cost about \$150,000, including machinery.

The International Harvester Co., 606 South Michigan Avenue, Chicago, has filed plans for a new brick and steel building at 2600 West Thirty-first Street, to cost about \$60,000.

The Chicago Solder Co., 218 North Union Avenue, Chicago, has awarded contract to E. L. Scheidenhelm Co., 111 West Monroe Street, for a two-story brick and reinforced concrete addition, 50x250 ft., to cost about \$100,000.

The Modern Foundry & Machine Co., 4725 Dupont Avenue, Minneapolis, Minn., is completing plans for a one-story steel foundry, 80x150 ft., to cost about \$60,000, including equipment.

The Saranac Automatic Machine Corporation, St. Joseph, Mich., has been incorporated in Delaware with a capital stock of \$400,000 by Edward Craig, J. J. Miller, St. Joseph; and E. C. Knott, Benton Harbor, Mich., to manufacture special machinery.

The Pacific Northwest

SEATTLE, May 25.

Business in all lines in this section, from the manufacturer to the retailer, shows a tendency downward. There seems to be considerable hesitation about starting new work, and the inability to get materials from Eastern points is a serious feature. Many industries show a disposition to contract rather than expand and an attempt to reduce their overhead.

The lumber market is uncertain and the car shortage is again becoming acute at Oregon and Washington mills.

The Lakeside Lumber Co., Klamath Falls, Ore., will build a planing mill at a cost of \$50,000, and to be completed within four months. The company has been re-organized with O. W. Robertson, president.

The Long Bell Lumber Co., Kansas City, Mo., plans the construction in Astoria, Ore., of a large lumber plant, work to start during the summer. R. A. Long is president.

The Sanitary Strainer & Novelty Mfg. Co., Portland, has been incorporated for \$15,000 to manufacture household novelties. Gus Gabrielson, J. E. Adams and others are the incorporators.

The Wheeler Iron Works, Wheeler, Ore., has been incorporated for \$5,000 by Wilbur McCrackern and others and will engage in general foundry and repair work.

The Sanford Friction Thresher Machine Co., Centralia, Wash., has purchased a site near that city, on which it is

planned to erect works for the manufacture of a thresher invented by A. C. Sanford, president. The company is capitalized at \$250,000.

The plant of the NorthPortland Box Co., and the wooden shipbuilding plant of the Standifer Shipbuilding Corporation, both in Portland, were completely destroyed in a recent fire, with loss between \$600,000 and \$1,000,000.

The Central South

ST. LOUIS, May 31.

The Standard Stamping Co., 2000 North Broadway, St. Louis, manufacturer of stamped metal products, is taking bids for a five-story plant, 53x60 ft., at Second and Madison streets, to cost about \$75,000.

The St. Louis Blow Pipe & Heating Co., 1948 North Ninth Street, St. Louis, has awarded a contract to H. F. Eidman, 1918 Adelaide Avenue, for the erection of a one-story plant, 80x142 ft., to cost about \$25,000. The installation will comprise a large assortment of sheet-metal working machinery. Charles N. Skinner is president.

The Advance Electric Co., 6315 Maple Avenue, St. Louis, manufacturer of electrical specialties, will soon call for bids for a one-story addition to its plant, 50x100 ft., to cost about \$15,000. E. Bretch is president.

The Kentucky Iron & Steel Co., Louisville, has been incorporated in Delaware with capital stock of \$450,000, by John J. Bell and H. H. Huffaker, Louisville, and R. W. Tietjen, Plainfield, N. J., to manufacture iron and steel products.

Fire, May 18, destroyed the lead and zinc works of the Freehold Oil & Gas Co., Waco, Mo., with loss estimated in excess of \$150,000.

The Bonnie-Smith-Epperson Co., Louisville, has been incorporated with a capital of \$60,000 by Herbert T. Bonnie, E. G. Smith and Samuel R. Epperson, to manufacture agricultural machinery.

The Chesapeake & Ohio Railroad, Richmond, Va., has awarded contract to the Arnold, Co., Chicago, for new machine and repair shops, engine houses and other structures at Russell, Ky., to cost in excess of \$300,000, including equipment.

The Majestic Mfg. Co., 2014 Morgan Street, St. Louis, manufacturer of cooking apparatus, etc., is having plans prepared for the remodeling of a building at Twenty-second and Morgan Streets, as an addition to its works. The improvements are estimated to cost about \$30,000.

The O. B. Wise Pulverizer Co., Knoxville, Tenn., recently incorporated with a capital stock of \$25,000, will operate a limestone machinery plant. It has a two-story building, 60x100 ft., and proposed to develop a capacity of about 50 limestone pulverizers a month. O. B. Wise is president and general manager.

The Common Council, Pawnee, Okla., has arranged for a bond issue of \$100,000 for the establishment of a municipal electric light and power plant.

The Minter Hardware Co., Oklahoma City, Okla., has been incorporated with a capital stock of \$250,000 by E. D. Minter, Oklahoma City; E. R. and J. C. Minter, Norman, Okla., to manufacture hardware and other metal products.

The Admiral Hay Press Co., Eighth and Mulberry streets, Kansas City, Mo., manufacturer of horse power hay presses, etc., has acquired an existing building in the vicinity of its works for extensions. The structure will be remodeled.

The Illinois Malleable Iron Co., which recently purchased a site in Louisville, has prepared plans for an annealing shop, 113x183 ft., and foundry, 147x263 ft., as the first unit of the plant. It has a 42-acre tract with railroad connections.

The Reciprocating Electric Tool Co., Louisville, has changed its name to the Electric Hammer Corporation, with a capital stock of \$1,000,000. James K. Jarvis is president.

The Peerless Mfg. Co., Fifteenth Street and Ormsby Avenue, Louisville, is planning to establish a new department for manufacturing stoves in addition to its present line of fireplace fixtures.

California

LOS ANGELES, May 25.

The Federal Rubber Co., 1239 Van Ness Avenue, San Francisco, is having plans prepared for a four-story, reinforced concrete plant on West Second Street, near Federal Street, to cost about \$125,000. E. G. Garden, Flood Building, is architect. Bids for erection will be asked about the middle of June.

The Theft Warning Auto Lock Corporation, Los Angeles,

has been incorporated with a capital stock of \$100,000 by F. G. Hoffine, Fred C. Adams and J. K. McDonald, to manufacture special locks and locking devices.

The Motor Parts Mfg. Co., 741 South San Pedro Street, Los Angeles, has filed notice of organization to manufacture automobile parts and other machined specialties. Rutledge J. Robinson, 808 West Fifteenth Street, heads the company.

The Southern Pacific Railroad Co., San Francisco, is having plans prepared for a one-story tank shop at its Bay Shore yards, South San Francisco, to cost about \$50,000. Bids for construction will be asked in June. The Engineering Department, Southern Pacific Building, 65 Market Street, is in charge.

The Southern California Edison Co., Los Angeles, has been granted permission to issue bonds for \$5,000,000, the proceeds to be used for the erection of power plants and extensions to present generating stations. The work at its No. 3, Kern River plant, is estimated to cost about \$1,985,000, while other work will be divided on the Big Creek power plants at Long Beach, Richgrove and other points. The company will build a new power station at San Bernardino, Cal., in co-operation with the Southern Sierras Power Co., to cost about \$250,000. The plant will be used jointly by both interests.

The California Brass Mfg. Co., Los Angeles, has been incorporated with a capital stock of \$10,000 by Nathan Brostoff, David M. Clayman and L. R. Raymond, to manufacture brass and bronze specialties.

Considerable mechanical and electrical machinery will be installed in the new plant of the General Chemical Co., 25 Broad Street, New York, to be located at El Segundo, Cal., and estimated to cost in excess of \$1,000,000, including equipment. The J. G. White Engineering Co., 43 Exchange Place, New York, is in charge of construction.

The Ohio Foundry, Vernon, Cal., has been incorporated with a capital stock of \$20,000 by Bernard G. Holtz, William J. Roth and Morris H. Williams, to manufacture iron and other metal castings.

The Edison Electric Appliance Co., Ontario, Cal., manufacturer of hot point electrical cooking and heating specialties, has arranged an appropriation of \$100,000 for additions to its plant. A number of one-story buildings will be erected.

The Mack Motor Co., 2020 Van Ness Avenue, San Francisco, is having plans prepared for a one-story and basement building at Eleventh Avenue and Howard Street, to cost about \$54,000.

The Los Angeles Engineering & Mfg. Co., Los Angeles, has been incorporated with a capital stock of \$25,000 by Vernon W. Balzer, William M. Alexander and John McK. Ballou, to manufacture mechanical and machine devices.

The Electric Motor Lock Corporation, Los Angeles, has been incorporated with a capital of \$100,000 by J. H. Rodorf, B. M. and G. B. Caldwell, to manufacture electrically operated locking devices.

L. G. Perkins, 515 Blackstone Street, Fresno, Cal., has had plans prepared for a new one-story foundry in the Blackstone Villa district.

The Gulf States

BIRMINGHAM, May 31.

The Etowah Foundry & Machine Co., North Sixth Street, Gadsden, Ala., manufacturer of iron, brass and copper castings, is planning for a new one-story machine shop. W. T. Murphee is president.

The Tank Tire & Rubber Co., Dallas, Tex., manufacturer of automobile tires, has arranged for the erection of a new plant, 150x240 ft.

The Galveston Wharf Co., Galveston, Tex., is planning for a series of cotton compress plants to serve the wharf district and to have an initial capacity of 1500 bales in 24 hr. Conveying equipment will be installed. The project is estimated to cost about \$500,000, including machinery.

The Peden Iron & Steel Co., Houston, Tex., has increased its capital stock from \$1,000,000 to \$2,500,000.

The Standard Battery Mfg. Co., 1103 North Main Street, Fort Worth, Tex., manufacturer of electric batteries, is planning for the erection of a reinforced concrete addition to its plant, to double the present output. Considerable new machine shop equipment, woodworking machinery, motors, etc., will be installed. Albert Kramer is president.

The Central Compress Co., Waco, Tex., is arranging for the erection of a cotton compress plant at Temple, Tex., to cost about \$25,000. Henry P. Smith is general manager.

The Gulf Coast Oil Jobbing Co., 810 Turnbow Building,

Houston, Tex., is planning for the erection of a new oil refinery at Harrisburg, Tex., to cost in excess of \$500,000, including equipment. It has secured a waterfront site for the proposed works, which will have a daily output of about 200 bbl. L. E. Landon is president.

The Bradford Supply Co., Burkburnett, Tex., will take bids at once for a new machine shop and pipe works.

The Victor Pipe Line & Refining Co., Dixon Building, Vernon, Tex., is planning for the erection of a new oil refinery with a daily capacity of about 2000 bbl., estimated to cost about \$150,000 with equipment.

The Cooper Irwin Motor Co., Amarillo, Tex., is planning for a two-story service building and repair works, 70x150 ft., to cost about \$150,000, including equipment.

The sawmill and machinery of the Nona Fletcher Co., Nona, Tex., was destroyed by fire, May 14, with loss estimated at \$50,000.

The Limbaugh Machine Co., Jacksonville, Fla., has been incorporated with a capital stock of \$20,000 by R. W. Limbaugh and Edgar I. DeWitt, to manufacture machinery and parts.

The St. Johns Oil & Refining Company, San Antonio, is preparing plans for an oil refinery in Corpus Christi.

The Peoples Ice Co., Wichita Falls, has increased its capital stock from \$25,000 to \$250,000 and will enlarge its ice making plant.

The Zorn Farmers' Gin Co., Zorn, has been incorporated with a capital stock of \$20,000. Emil Rose is a stockholder.

The Lovington Public Utilities Co., Lovington, N. M., will construct an electric light and power plant at Bronco, Tex. It has a capital stock of \$50,000.

The Crockett Brick, Tile & Mfg. Co., Crockett, recently incorporated with a capital stock of \$150,000, has purchased 72 acres upon which it will build a plant with a daily capacity of 40,000 bricks.

The City Council, Toyah, has granted a franchise to Jesse Knight for the construction of an electric light and power plant.

The Hibbs Rubber Co., Fort Worth, is constructing an automobile tire manufacturing plant with 75,000 ft. of floor space. It will manufacture tires and other rubber goods. C. D. Hibbs is president.

The Shippers' Compress Co., Dallas, has increased its capital stock from \$600,000 to \$1,800,000 and will enlarge its facilities.

The Farmers' Gin Co., Roxton, has been incorporated with a capital stock of \$30,000. D. C. Weaver is a stockholder.

The electric light and power plant of the Texas Gas & Electric Company, Wharton, recently destroyed by fire with a loss of \$100,000, will be rebuilt.

The Texas Public Service Company, of which A. V. Foster, Toledo, Ohio, is president, has under consideration extensions and improvements to its electric light and power plant at Vernon, which will involve an expenditure of about \$100,000.

E. F. Dolan, Vernon, Tex., has purchased a site upon which he will build a boiler, welding and machine shop.

The Wilson Gin Co., Wilson, Tex., has been incorporated with a capital stock of \$15,000 and will build a cotton gin. W. M. Green is a stockholder.

The Oklahoma Oil Works, Tampico, Mexico, has changed its name to the Tampico Marine & Iron Works. The company is enlarging its machine shop.

The Dunnigan Tool & Supply Co., Breckenridge, has been incorporated with a capital stock of \$125,000 by J. B. Dunnigan, T. J. Hinerman and E. W. Bisett.

Canada

TORONTO, May 31.

The Moncrief Furnace Co., Guelph, Ont., proposes to make considerable improvements and extensions to its plant, according to a statement. The company recently acquired additional ground and will erect a new foundry. T. E. Henry is president and E. S. Moncrief, treasurer.

The Fraser Companies, Ltd., has purchased the plant of the Dominion Pulp Mills at Chatham, N. B. It is now the intention of the company to greatly extend its scope of operations in the Maritime Provinces. A bill has been introduced in the New Brunswick Legislature, involving a reorganization on a large scale of the Fraser Companies, and having as its aim the establishment of a large power plant at Tobique Narrows, and the erection of a sulphite pulp and paper mill for the manufacture of newsprint.

The Davie Shipbuilding Corporation, Levis, Que., a subsidiary of the British Empire Steel Corporation, has taken

options on property in Lauzon, Que., with the intention of building a plant for the manufacture of ship steel.

The Canadian Pacific Railway, Montreal, will spend between \$400,000 and \$500,000 on extensions and improvements to its yards at Windsor, Ont.

The United Iron Works & Machine Co., Toronto, has purchased the textile buildings near the Canadian Pacific Railway tracks at Milton, Ont., and will remodel the buildings and install equipment for the manufacture of the Orr patent double piston cylinder engine, machinery, tools, etc.

The Matheson Products Co., Matheson, Ont., has purchased 190 acres there and will establish a plant for the manufacture of brick, tile and terra cotta. The initial works will have a daily capacity of 20,000 bricks which will be increased later to about five times that capacity. R. S. Potter is president of the company and R. L. Ollman is manager.

J. Evans, architect, 30 Water Street North, Galt, Ont., will receive bids until June 5, for the erection of a machine shop for Elliott & Whitehall, Hobson Street, to cost \$25,000.

The Northern Electric Co., 121 Shearer Street, Montreal, will build an addition, construction to start at an early date. Mr. Cameron is assistant general manager.

T. L. Arnett, Souris, Man., is contemplating the erection of a factory in Regina, Sask., for the manufacture of store fixtures, etc.

Walter T. Piggott, Dougall Avenue and London Street West, Windsor Ont., will erect planing mill, boiler house, dry kilns, etc., to cost \$35,000.

The Canadian Iron Foundries, Ltd., Fort William, Ont., has let the general contract to M. H. Bradin and Francis Block, Fort William, Ont., for a foundry addition to cost \$20,000.

V. S. McIntyre, superintendent of Light Commission, Kitchener, Ont., will receive bids until June 15 for the construction of a power station to cost \$10,000.

J. W. Johnson, Inwood, Ont., will rebuild an electric light plant and garage recently destroyed by fire and will require machinery, etc.

The Collapsible Tubes & Containers, Ltd., Toronto, has been incorporated with a capital stock of \$750,000 by Kenneth S. Zimmerman, 609 Avenue Road; Justin E. Robinson, 583 Avenue Road; Edward J. Swift and others.

The Champion Rubber Co., Ltd., Toronto, has been incorporated with a capital stock of \$500,000 by John D.A. Bradford, 24 King Street West; Jacob H. Greenberg, 20 Grange Avenue; Edmund B. Titus and others to manufacture automobile tires, accessories, rubber goods, etc.

The Brunswick Canadian Products Co., Ltd., Woodstock, Ont., has been incorporated with a capital stock of \$500,000 by James S. Lovell, 25 King Street West; Charles D. Magee, 300 St. George Street; William Bain and others of Toronto, to manufacture sound producing machines, musical instruments, tools, etc.

The Dalton Adding Machine Co., of Canada, Ltd., Toronto, Ont., has been incorporated with a capital stock of \$40,000 by Joseph L. Phelan, 72 Queen Street West; Daniel P. J. Kelly, John Dishart and others.

The Yeldarb Mfg. Co., Ltd., Toronto, has been incorporated with a capital stock of \$1,000,000 by Alvin B. Ruddy, 31 Bloor Street East; Edward J. Syme, Brayton Stinson and others to manufacture separators, agricultural implements, tools, etc.

The Delahay-Cone Mfg. Co., Ltd., Brockville, Ont., has been incorporated with a capital stock of \$50,000 by Russell L. and George W. Delahay, David S. Cone, Arthur G. Parish and others to manufacture automobile parts, accessories, engines, machinery, tools, etc.

The Acton Tool & Stamping Co., Ltd., Toronto, has been incorporated with a capital stock of \$100,000 by William B. McPherson, 6 King Street West; Norman S. Caudwell, and others to manufacture machinery, castings, forgings, etc.

The Canadian Trucks, Ltd., Toronto, have been incorporated with a capital stock of \$150,000 by Robert B. Burkell, 186 Rusholme Road; Jeremiah W. Curran, Alexander E. Gray and others to manufacture trucks, parts, engines, etc.

Fried Brothers, Glace Bay, N. S., is in the market for a second-hand locomotive crane, capacity 15 to 20 tons, standard gage.

The McClary Mfg. Co. has purchased the stove and furnace plant of the William Buck Stove Co., Brantford, Ont.

The Georgian Bay Cement Works, Owen Sound, Ont., is preparing plans for improvements to its plant, and will spend \$75,000 on new kilns and machinery.

SHORT TRADE ITEMS

The Columbia, Pa., plant of the Reading Iron Co., recently purchased from the Columbia Rolling Mill Co., was to have started operations about June 1, according to announcements made by M. N. Clepper, Columbia manager of the Reading firm. The boilers are now being tested, preparatory to the starting of operations. Large quantities of ore, pig iron and coal have been received.

Title to the Susquehanna Rolling Mill, South Front Street, Columbia, Pa., was acquired last week by the Superior Tube Co., which will manufacture steel pipe. The new Superior firm is made up of men formerly identified with the Youngstown Sheet & Tube Co.

Marshall Furnace, Newport, Pa., has been compelled to discontinue operations because of the practical exhaustion of its coke supply, with no immediate prospect of receiving additional supplies.

The Spanish-American Iron Co., Bethlehem, Pa., has filed notice with the Pennsylvania State Department of a change of name to the Bethlehem-Cuba Iron Mining Co., Bethlehem, Pa.

The plant of the Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., was closed the afternoon of May 17, in memory of William T. Hildrup, Jr., former general manager of the plant, whose funeral was held then.

The Willey's Co., Columbia, Pa., manufacturer of laundry machinery, has declared a semi-annual dividend of 3 per cent. The company last fall succeeded the Columbia Mfg. Co.

The Davis-Bournonville Co., Jersey City, N. J., manufacturer of oxy-acetylene and oxy-hydrogen welding and cutting apparatus, has acquired a new and larger factory location for its Canadian plant, which will be moved from Niagara Falls, Ont., to Toronto, in June. The Toronto sales office will be moved from its present location on King Street West, to quarters in the new factory building at 32-34 Eastern Avenue. The company's Montreal sales office will be moved about June 1, from Craig Street West, to quarters in the Coristine Building.

The Federal Iron Works Co. has commenced operations on a small scale at Youngstown, Ohio., and will manufacture ornamental iron, steel and wire products. A. Schmidt, general manager of the Lau Iron Works, will assume charge of the Federal Iron Works Co. on June 1 as vice-president and general manager. J. M. McCarthy, in charge of the socket department of the Youngstown Sheet & Tube Co., Youngstown, Ohio, is president of the company, F. C. Dustman is secretary, and J. M. Flood is treasurer. The officers and F. F. Boyle are directors.

The Ordnance Department, Springfield, Mass., is arranging for a reduction of the working force at the local arsenal from 2600 to 900 men, the latter figure being the peace-time average at the plant. It is expected to make the change as the various departments complete their allotments, with entire reduction by August 1.

The Steel Sales Corporation, Adams and Jefferson streets, Chicago, has let a contract for the construction of a one-story steel warehouse, 195x324 ft., at 3322 South Crawford Avenue, to cost \$200,000.

The United States Civil Service Commission announces examinations by mail as follows: Designing engineer, electrical and mechanical, or radio, at \$2,500 to \$3,000 a year (Form 2118); technical examiner for mineral and metal claims investigations at \$3,300 to \$4,800 a year (Form 1312). Applicants should apply for the form as given, stating the title of the examination desired, to the Civil Service Commission, Washington, or the secretary of the United States Civil Service Board at the nearest customhouse.

Current Metal Prices

On Small Lots, from Merchants' Stocks, New York City

The quotations given below are for small lots, as sold from stores in New York City by merchants carrying stocks.

As there are many consumers whose requirements are not sufficiently heavy to warrant their placing orders with manufacturers for shipment in carload lots from mills, these prices are given for their convenience.

On a number of articles the base price only is given, it being impossible to name every size.

The wholesale prices at which large lots are sold by manufacturers for direct shipment from mills are given in the market reports appearing in a preceding part of THE IRON AGE under the general headings of "Iron and Steel Markets" and "Metal Markets."

Iron and Soft Steel Bars and Shapes	
Bars:	Per lb.
Refined iron, base price.....	5.25c.
Swedish bars, base price.....	20.00c.

Soft Steel:	
¾ to 1½ in., round and square.....	3.52c. to 5.25c.
1 to 6 in. x ¾ to 1 in.....	3.52c. to 5.25c.
1 to 6 in. x ¾ to 5/16.....	3.62c. to 5.25c.
Rods—¾ and 11/16.....	3.57c. to 5.05c.
Bands—1½ to 6 by 3/16 to No. 8.....	4.22c. to 6.50c.
Hoops.....	5.57c. to 6.50c.

Shapes:	
Beams and channels—3 to 15 in.....	3.47c. to 5.25c.

Angles:	
3 in. x ¾ in. and larger.....	3.47c. to 5.25c.
3 in. x 3/16 in. and ¾ in.....	3.72c. to 5.60c.
1½ to 2½ in. x ¾ in.....	3.52c. to 5.90c.
1½ to 2½ in. x 3/16 in. and thicker.....	3.47c. to 5.85c.
1 to 1¼ in. x 3/16 in.....	3.52c. to 5.90c.
1 to 1¼ x ¾ in.....	3.57c. to 5.95c.
¾ x ¾ x ¾ in.....	3.62c. to 6.00c.
¾ x ¾ in.....	3.67c. to 6.05c.
¾ x ¾ in.....	4.07c. to 6.85c.
½ x 3/32 in.....	5.17c. to 7.55c.

Tees:	
1 x ¾ in.....	3.87c. to 6.25c.
1¼ in. x 1¼ x 3/16 in.....	3.77c. to 6.15c.
1½ to 2½ x 3/16 in. and thicker.....	3.57c. to 5.95c.
3 in. and larger.....	3.52c. to 5.30c.

Merchant Steel	
	Per lb.
Tire, 1½ x ½ in. and larger.....	5.00c. to 5.25c.
(Smooth finish, 1 x 2½ x ¾ in. and larger).....	5.50c.
Toe calk, ½ x ¾ in. and larger.....	6.00c.
Cold-rolled strip (soft and quarter hard).....	12c. to 14c.
Open-hearth spring steel.....	7.00c. to 10.00c.
Shafting and Screw Stock:	
Rounds.....	6.25c. to 7.00c.
Squares, flats and hex.....	6.75c. to 7.50c.
Standard cast steel, base price.....	15.00c.
Best cast steel.....	20.00c. to 24.00c.
Extra best cast steel.....	25.00 to 30.00c.

Tank Plates—Steel	
	Per lb.
¾ in. and heavier.....	3.67c. to 5.50c.

Sheets	
Blue Annealed	
	Per lb.
No. 10.....	7.12c. to 8.00c.
No. 12.....	7.15c. to 8.05c.
No. 14.....	7.22c. to 8.10c.
No. 16.....	8.32c. to 8.20c.

Box Annealed—Black	
	Per lb.
Soft Steel	
C.R., One Pass	per lb.
Nos. 18 to 20.....	8.30c. to 9.90c.
Nos. 22 and 24.....	8.35c. to 9.85c.
No. 26.....	8.40c. to 9.90c.
No. 28.....	8.50c. to 10.00c.
No. 30.....	8.60c. to 10.10c.
No. 28, 36 in. wide, 10c. higher.	

Galvanized	
	Per lb.
No. 14.....	8.75c. to 10.50c.
No. 16.....	9.00c. to 10.75c.
Nos. 18 and 20.....	9.15c. to 10.90c.
Nos. 22 and 24.....	9.30c. to 11.05c.
No. 26.....	9.45c. to 11.20c.
No. 27.....	9.60c. to 11.35c.
No. 28.....	9.75c. to 11.50c.
No. 30.....	10.25c. to 12.00c.
No. 28, 36 in. wide, 20c. higher.	

Standard—Steel	
	Per lb.
Blk. Galv.	
¾ in. Butt... —36 —19	¾-1½ in. Butt. —15 + 5
¾-3 in. Butt. —40 —24	2 in. Lap..... — 7 + 11
3½-6 in. Lap. —35 —20	2½-6 in. Lap.. — 9 + 7
7-12 in. Lap. —25 — 8	7-12 in. Lap.. + 2 + 20

Steel Wire	
	Per lb.
BASE PRICE* ON NO. 9 GAGE AND COARSER	
Bright basic.....	8.00c.
Annealed soft.....	8.00c.
Galvanized annealed.....	8.50c.
Coppered basic.....	8.50c.
Tinned soft Bessemer.....	10.00c.

*Regular extras for lighter gages.

Brass Sheet, Rod, Tube and Wire	
	Per lb.
BASE PRICE	
High Brass Sheet.....	28¼c. to 29½c.
High Brass Wire.....	28¼c. to 29½c.
Brass Rod.....	26¼c. to 29 c.
Brass Tube.....	42½c. to 44½c.

Copper Sheets	
	Per lb.
Sheet copper, hot rolled, 24 oz., 29½c. per lb. base.	
Cold rolled, 14 oz. and heavier, 2c. per lb. advance over hot rolled.	

Tin Plates	
	Per lb.
Bright Tin	
Grade "AAA" 14x20	Grade "A" 14x20
Charcoal 14x20	Charcoal 14x20
IC... \$16.50	\$14.25
IX... 18.75	16.25
IXX... 20.50	18.00
IXXX... 22.25	19.75
IXXXX... 23.75	21.50

Terne Plates	
	Per lb.
8-lb. Coating 14x20	
100 lb.....	\$9.35
IC.....	9.50
IX.....	10.50
Fire door stock.....	12.75

Tin	
	Per lb.
Straits pig.....	57c.
Bar.....	63c. to 70c.

Copper	
	Per lb.
Lake ingot.....	21c. to 22c.
Electrolytic.....	20c. to 21c.
Casting.....	19½c. to 20c.

Spelter and Sheet Zinc	
	Per lb.
Western spelter.....	10c. to 11c.
Sheet zinc, No. 9 base, casks.....	14½c. open 15c.

Lead and Solder*	
	Per lb.
American pig lead.....	10c. to 11c.
Bar lead.....	11c. to 12c.
Solder ¾ and ½ guaranteed.....	40c.
No. 1 solder.....	37c.
Refined solder.....	33c.

*Prices of solder indicated by private brand vary according to composition.

Babbitt Metal	
	Per lb.
Best grade, per lb.....	90c.
Commercial grade, per lb.....	50c.

Antimony	
	Per lb.
Asiatic.....	11¼c. to 11½c.

Aluminum	
	Per lb.
No. 1 aluminum (guaranteed over 99 per cent pure), in ingots for remelting, per lb.....	35c. to 38c.

The market is very quiet and transactions few. Dealers' buying prices are as follows:

Old Metals	
	Cents per lb.
Copper, heavy and crucible.....	16.00
Copper, heavy and wire.....	15.25
Copper, light and bottoms.....	13.75
Brass, heavy.....	10.25
Brass, light.....	7.50
Heavy machine composition.....	15.50
No. 1 yellow brass turnings.....	9.50
No. 1 red brass or composition turnings.....	12.25
Lead, heavy.....	7.00
Lead, tea.....	5.00
Zinc.....	5.25

